This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

BOSTON
MEDICAL LIBRARY

IN THE
Francis A. Countway
Library of Medicine
BOSTON

BOSTON
MEDICAL LIBRARY

IN THE
Francis A. Countway
Library of Medicine
BOSTON

PUBLIC HEALTH

PAPERS AND REPORTS

VOLUME XXIX

PRESENTED AT THE THIRTY-FIRST ANNUAL MEETING OF THE

American Public Health Association

WASHINGTON, D. C.

OCTOBER 26, 27, 28, 29 AND 30,

1903

COLUMBUS, OHIO
PRESS OF FRED. J. HEER
1904

COPYRIGHT 1904,
BY DR. CHARLES O. PROBST, SECRETARY
AMERICAN PUBLIC HEALTH ASSOCIATION,
COLUMBUS, OHIO.

All Rights Reserved.

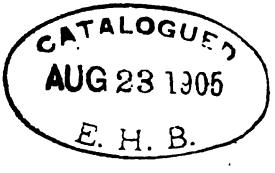

TABLE OF CONTENTS.

	PAGE
PRESIDENT'S ADDRESS. By WALTER WYMAN, M. D.	1
ADDRESS OF WELCOME. By GEN. GEORGE M. STERNBERG, M. D.	13
ADDRESS OF WELCOME. By HON. H. B. F. MCFARLAND	17
REPORT OF THE COMMITTEE ON ANIMAL DISEASES AND ANIMAL FOOD. By D. E. SALMON, D. V. M., Chairman	20
THE RELATION BETWEEN HUMAN AND BOVINE TUBERCULOSIS. By MAZYCK P. RAVENEL, M. D.	31
REPORT OF COMMITTEE ON ETIOLOGY OF YELLOW FEVER. By JOHN W. ROSS, M. D., Chairman	39
REFLECTIONS ON THE DESIRABILITY OF AN AGREEMENT BETWEEN THE SANITARY AUTHORITIES OF ADJOINING COUNTRIES FOR MUTUAL DEFENSE AGAINST TRANSMISSIBLE DISEASES. By EDUARDO LICEAGA, M. D.	43
COMMENTS ON THE REPORT OF THE COMMITTEE ON THE ETIOLOGY OF YELLOW FEVER. By JUAN GUITERAS, M. D.	47
SOME CHARACTERISTICS OF THE STEGOMYIA FASCIATA WHICH AFFECT ITS CONVEYANCE OF YELLOW FEVER. By HENRY R. CARTER, M. D.	50
PERIOD OF THE DISEASE IN MAN DURING WHICH YELLOW FEVER CAN BE TRANSMITTED TO THE MOSQUITO. By COL. W. C. GORGAS, M. D.	65
NEW ASPECTS OF YELLOW FEVER ETIOLOGY ARISING FROM EXPERIMENTAL FINDINGS OF THE LAST THREE YEARS. By CARLOS J. FINLAY, M. D.	68
CONCERNING THE GEOGRAPHIC DISTRIBUTION OF THE YELLOW FEVER MOSQUITO. By L. O. HOWARD, PH. D.	71
THE MOSQUITOES IN MEXICO CITY. By LUIS E. RUIZ, M. D.	77
QUARANTINE REGULATIONS SHOULD BE BASED AGAINST YELLOW FEVER UPON THE DOCTRINE THAT IT IS ONLY CONVEYED BY THE MOSQUITO. By J. M. LINDSLEY, M. D.	81
REPORT OF COMMITTEE ON THE PURIFICATION OF WATER SUPPLIES. By GEORGE W. FULLER, CHAIRMAN	91
REPORT OF COMMITTEE ON CANTEENS IN ARMIES. By GEORGE M. KOBER, M. D., Chairman	98
REPORT OF THE COMMITTEE ON THE CAUSES AND PREVENTION OF INFANT MORTALITY. By HENRY MITCHELL, M. D., Chairman	122
REPORT OF THE COMMITTEE ON THE TEACHING OF HYGIENE AND THE CONFERRING OF A DEGREE IN PUBLIC HEALTH. By BENJAMIN LEE, M. D., Chairman	124
REPORT OF COMMITTEE ON SANITARY AID SOCIETIES. By GEORGE W. GOLER, M. D.	128
REPORT OF THE COMMITTEE ON DISPOSAL OF GARBAGE AND REFUSE. By RUDOLPH HERING, Chairman	129
THE SANITARY DISPOSAL OF MUNICIPAL AND INSTITUTIONAL WASTE BY CREMATION. By WILLIAM F. MORSE	134
SOME STATISTICS OF GARBAGE DISPOSAL FOR THE LARGER AMERICAN CITIES IN 1902. By C.-E. A. WINSLOW and P. HANSEN	141
REPORT OF COMMITTEE ON DISPOSAL OF INDUSTRIAL WASTES. By GARDNER T. SWARTS, M. D., Chairman	166

	PAGE
REPORT OF THE COMMITTEE ON CAR SANITATION. By GRANVILLE P. CONN., M. D., Chairman	167
TRANSPORTATION OF PERSONS SICK WITH TRANSMISSIBLE DISEASES. By J. N. HURTY, M. D.	184
ON CAR SANITATION IN THE REPUBLIC OF MEXICO. By JUAN BRENA, M. D.	188
PERTAINING TO THE TRANSPORTATION OF THE DEAD. By H. M. BRACKEN, M. D.	193
REPORT OF COMMITTEE ON DEMOGRAPHY AND STATISTICS IN THEIR SANITARY RELATION. By W. A. KING, Chairman	201
SOME INDICATIONS THAT MAY SERVE FOR THE BETTER UTILIZATION OF THE RESULTS DERIVED FROM A COMPARISON OF THE PRINCIPAL CAUSES OF DEATH IN THE CITIES THAT APPLY THE INTERNATIONAL NOMENCLATURE. By J. E. MONJARAS, M. D.	205
REPORT OF COMMITTEE ON DISINFECTION AND DISINFECTANTS. By PROF. F. C. ROBINSON, CHAIRMAN	208
DISINFECTION IN MEXICO. By LUIS E. RUIZ, M. D.	213
EXPERIMENTAL STUDY OF HYDROCYANIC ACID AS AN INSECTICIDE. By FERNANDO LOPEZ, M. D.	214
REMARKS ON THE PREPARATION OF VACCINE VIRUS. By JOHN F. ANDERSON, M. D.	221
IMMIGRATION AND THE PUBLIC HEALTH. By A. J. MCLAUGHLIN, M. D.	224
FACTORS OPERATIVE IN THE SPREAD OF A CHOLERA EPIDEMIC AND THE MANAGEMENT OF THE SAME FROM A QUARANTINE STANDPOINT. By J. C. PERRY, M. D.	232
A NATIONAL INSTITUTE OF HYGIENE. By FRED J. MAYER, M. D.	239
MEASURES FOR RESTRAINING THE PROPAGATION OF VENERO-SYPHILITIC DISEASES. By ULISES VARDES, M. D.	244
THE FLOORS OF HOSPITAL WARDS, CONSIDERED FROM THE STANDPOINT OF ASEPSIS AND ANTISEPSIS. By M. MARQUEZ, M. D.	247
HYGIENE OF THE EYES IN THE MEXICAN SCHOOLS. By M. URIBE TRONCOSO, M. D.	250
SOMETHING ABOUT THE BACTERIOLOGY AND CLINICAL HISTORY OF PLAGUE. By O. GONZALES FABELA, M. D.	253
OFFICIAL REPORT OF THE PROCEEDINGS OF THE THIRTY-FIRST ANNUAL MEETING	259
PAPERS AND REPORTS PRESENTED TO THE SECTION OF BACTERIOLOGY AND CHEMISTRY	329
THE DEVELOPMENT OF AMERICAN BACTERIOLOGY. By H. L. RUSSELL	329
FOUR YEARS' EXPERIENCE IN AN ATTEMPT TO MAKE A BACTERIAL COUNT OF 100,000 BACTERIA PER C.C., A STANDARD FOR MUNICIPAL MILK SUPPLY. By G. W. GOLER, M. D. and F. R. EILINGER, PH. D.	338
THE RELEASE OR QUARANTINE IN DIPHTHERIA. By THOMAS W. SALMON, M. D.	341
REPORT OF COMMITTEE ON LABORATORY TESTS OF THE EFFICIENCY OF WATER FILTERS. By GARDNER T. SWARTS, M. D., Chairman	345
THE EFFECT OF LEMON JUICE IN THE MIXTURE KNOWN AS LEMONADE UPON TYPHOID-POLLUTED WATER. By WILLIAM G. BISSELL, M. D.	352
ABSTRACT OF A PAPER ENTITLED A CRITICAL STUDY OF THE METHODS IN CURRENT USE FOR THE DETERMINATION OF FREE AND ALBUMINOID AMMONIA IN SEWAGE. By RUDOLPH HERING	354

TABLE OF CONTENTS.

	PAGE
Abstract of a Paper Entitled "A Dangerous Food-Preservative." By Charles Harrington, M. D.	355
Report of the Committee on the Significance of B. Coli in Water Supplies. By S. C. Prescott	356
A Simple Method for the Routine Detection of the Colon Bacillus in Water. By William Royal Stokes, M.D	359
The Bacterial Examination of 104 Samples of Water, Together With a Detailed Study of the Colon Bacillus. By Wm. G. Bissell, M. D.	360
A Differential Test for Typhoid and Colon Bacilli. By F. C. Harrison	367
On Some Cultural Relations and Antagonisms of Bacillus Coli and Houston's Sewage Streptococci; With a Method for the Detection and Separation of These Micro-Organisms in Polluted Water. By S. C. Prescott and S. K. Baker	369
Abstract of a Paper Entitled "Isolation of Bacillus Coli Communis From the Alimentary Tract of Fish and the Significance Thereof." By George A. Johnson	385
On the Value of Tests for Bacteria of Specific Types as an Index of Pollution. By H. W. Clark and Stephen DeM. Gage	386
Abstract of a Paper Entitled "Studies of Media for the Quantitative Estimation of Bacteria in Water and Sewage. By Stephen DeM. Gage and George O. Adams	398
Report of Committee on Bacillus Tuberculosis in Man and Animals. By Mazyck P. Ravenel, M. D.	400
A Test of the Immunity of Cattle Inoculated with Tuberculosis Over-Against a Natural Exposure. By E. A. deSchweinitz and E. C. Schroeder	402
The Passage of Tubercle Bacilli Through the Normal Intestinal Wall. A Preliminary Report. By Mazyck P. Ravenel, M. D.	404
The Etiology of Yellow Fever. An Addendum. By James Carroll, M. D.	406
Report of the Committee on Resolutions on the Death of Dr. Wyatt Johnston	416
Constitution	i
By-Laws of the Executive Committee	vi
Officers and Committees, 1903-1904	ix
Revised List of Members	xviii
Members Elected at Washington Meeting	xxix
List of Members by Geographical Distribution	xxx
Sanitary Authorities and Associations	xxxix
Index	li

BOSTON MEDICAL
AUG 23 1905
LIBRARY

PRESIDENT'S ADDRESS.

By Dr. WALTER WYMAN,

Surgeon-General U. S. Public Health and Marine Hospital Service, and President American Public Health Association, Washington, D. C.

Members of the Public Health Association, Ladies and Gentlemen:

A little less than one year ago, in that beautiful Crescent City, where warmth and geniality characterize both the climate and the heart of man, this Association surprised me with the great honor of election as President. More deeply appreciated was this honor because of the kind expressions in the annual address of the then President and because of the resolution passed by the Association, in which words of cheer, confidence, and cordial support were offered to the Service just entering, under new legal development, upon its duties as the public health service of the United States. The members of this Association, many of whom are themselves in public life, need not be told how helpful are such expressions to an individual or a public service. In the intervening months the good will of the Association has been a constant inspiration, and weighty matters have seemed far less difficult by reason of the sympathy and encouragement so happily conveyed by this resolution.

It is but fitting here to give some narration of the measures relating to public health considered or acted upon during these intervening months. Not that you are to be burdened with a wearisome detail of department transactions, but some facts of interest should be made known and they may briefly and more conveniently be disposed of before entering upon other considerations.

The Hygienic Laboratory provided by Congress for the investigation of infectious and contagious diseases and matters relating to the public health has been completed, is now receiving its equipment, for which an adequate sum has been provided, and will soon be occupied. The building — open to your inspection — is beautifully located on the grounds occupied by the old Naval Observatory; and the reservation of five acres is sufficient for additional buildings which Congress may be asked to grant from time to time as the necessity becomes manifest. The Advisory Board, now complete, represents the three medical services of the Government and the Department of Agriculture, and contains the names of five distinguished scientists connected with other institutions. Of the three new divisions — Medical

Zoölogy, Pharmacology and Chemistry — the two former have been provided each with an official head, the last appointment being that of Dr. Reid Hunt from the Johns Hopkins University as Chief of the Division of Pharmacology. During the year some of the results of the laboratory work have been published in ten bulletins of scientific importance to the public health.

YELLOW FEVER INSTITUTE.

The Yellow Fever Institute, founded for continuous investigation of yellow fever and organized to utilize the findings and personal services of any member of the profession at home or abroad, has issued a bulletin (No. 13), the report of a special working party which conducted experiments in Vera Cruz, Mexico, about a year ago.

A second working party is at present engaged in Vera Cruz, repeating and confirming or otherwise the experiments of working party No. 1, and making such additional experiments as are prompted in the course of their investigations.

VIRUSES, SERUMS AND ANTITOXINS.

In accordance with the act of Congress to regulate the sale of vaccine and other viruses, serums and antitoxins, regulations were promulgated, effective August 21st, and inspections made of the various establishments in the United States engaged in the manufacture of these products. Ten plants were inspected, six recommended for license and four for refusal. Of the four refused, two were subsequently reinspected, the faults having been remedied. Several establishments, rather than submit to inspection, closed their business. In all, eight establishments in the United States have received licenses from the Secretary of the Treasury.

CONFERENCES.

The conferences held during the past year are worthy of note.

It will be remembered that the Conference of American States in Mexico, in January, 1902, provided for an International Sanitary Convention of the American Republics. This Convention met in Washington in December of the same year, 11 republics being represented by 27 delegates. Sanitary and quarantine resolutions of value were adopted, and an International Sanitary Bureau formed with headquarters in Washington under the aegis of the Bureau of American Republics. The transactions of the Sanitary Convention have been published in Senate Document No. 169, 57th Congress, 2d Session. A second Convention will be held in Chili next March.

The value of Section 7 of the new public health law has been demonstrated in two conferences between the Public Health and Marine Hospital Service and state health authorities. The first was held last January in accordance with requests from 22 state boards of health to consider the plague situation in San Francisco. The good results are known to most of you, and the transactions of this, the first conference under the law, are preserved in printed form.

The second conference, being the conference which the Surgeon-General of the Public Health and Marine Hospital Service is required by law to call once every year, was held in Washington last June, 22 states and territories being represented and letters of regret being read from others. The results of this conference will be referred to later, and its transactions, making a valuable volume for reference, are now in the hands of the printer.

It may be said that both these conferences have developed a spirit of coöperation of great present and still greater. prospective value.

AMERICAN PUBLIC HEALTH ASSOCIATION.

The foregoing may be considered as a report of progress voluntarily made to an association devoted for more than 30 years to every phase — scientific and administrative — of public health advancement. Our American Public Health Association illustrates that individual, unselfish devotion to the public welfare on which depends the hope of self-governing people.

Annually it holds its deliberations in widely separated portions of our land, in Canada, or Mexico, that its very presence may arouse interest and give encouragement to local sentiment and official laborers in the same broad field. Its discussions and reports of committees preserved in its 28 volumes of transactions form a library creditable to its membership and of great public utility.

On joining this Association in 1884 my first impression was that of the earnestness of its members and the evident thorough study of the subjects under discussion. As a whole, the meeting seemed to me an exhibition of educated patriotism — of time and labor given for nothing but the public welfare.

Since then, the Association has widened its territory, constantly preserving in its annual meetings these same characteristics.

In 1885 we were strengthened by the addition of our representatives from Canada, whose scholarly attainments have since constantly added to our meetings. Their hospitality will make ever memorable our meetings at Ottawa, Toronto and Montreal.

In 1890 our power was further augmented by accessions from Mexico. Its superior board of health has so frequently been repre-

sented in our meetings that its learned and accomplished President and his colleagues have become familiar and welcome figures. Our meeting in the city of the Montezumas in 1892 forms one of our brightest chapters.

And last year independent Cuba, the Gem of the Antilles, freed at last from the scourge of yellow fever, joined us.

Thus, with widened scope and increasing strength, are we assembled for the thirty-first annual meeting.

But not all are here who may have attended our thirteenth meeting. Nine of our members can be present only through the influence of their lives and through memory of the departed vouchsafed to the living. As their names are read, their familiar forms and faces, their social graces and their efforts and achievements, will receive mental recognition by this audience.

Dr. John Morris of Baltimore,
Dr. James A. Steuart of Baltimore,
Dr. J. F. Hibberd of Richmond, Indiana,
Dr. Isaac N. Love of New York,
Dr. Susan Remsen Pray of Brooklyn,
Dr. Eugene Foster of Augusta, Georgia,
Dr. Bushrod W. James of Philadelphia,
Dr. William P. Munn of Denver,
Dr. William Thomas Dalby of Salt Lake City.

We hereby place these names upon the roll of honor. With others gone before, they will receive the praise of the future historian who will trace in our annals the inception and growth of those efforts of this Association which have proven factors in the progress of the race.

CIVIC ADMINISTRATION AND SANITATION.

Current comment of the newspapers and magazines shows something of the place which civic administration has come to occupy in the public mind. "Municipal government," it has been well said, "presents the most serious problems of the social scientist of today; it is our political life at its source. When the secret of good municipal government has been found, the whole political problem of good government will be solved." I believe, continuing this idea, that the insanitary condition of our cities presents a condition parallel to that of their political corruption. Municipal betterment would proceed faster if its promoters realized that an achievement may fail when too much at one time is attempted, but may succeed by efforts in detail. By seizing upon one highly important element of municipal reform and for the time being concentrating all energies upon it good

citizens would achieve a success not only invaluable in itself, but one which would serve as a point of vantage for other efforts.

The relation of sanitation to municipal reform is not duly appreciated. Like many a penitent told by his clergyman that he needs a physician rather than a confessor, the stricken municipality might often be told that its first immediate necessity is better sanitation. Moral reforms would more easily follow.

THE NEED AND EFFECT OF SANITATION.

The good effects of sanitation on the moral and physical condition of people have been the theme of many able writers and statisticians. It goes without saying that crime lurks in the dark, unwholesome, parts of our cities. Diminution of disease and remarkable decrease in the death rate have been amply demonstrated as the results of sanitation. "The span of life," says Dr. Kober, quoting from Mulhall's Statistics, "has been lengthened six years since 1880." The annual mortality of London between 1660 and 1678 was 80 per 1,000; from 1801 to 1835, it was still 29; it now averages between 17 and 19. The annual death rate of New York in 1875 was more than 29 per 1,000, and is today only about 18.

Large cities here and abroad have shown the effect on health and commercial prosperity of purely sanitary measures. Among others, may be named New York, with its tenement house victories; San Francisco in its sanitary struggle in Chinatown; and Memphis, with its sewerage reformation in the warfare against yellow fever. Other and smaller cities are exemplars of this great truth, not to mention Havana, so near our coast, as to be a factor in our own health conditions. It is peacefully resting today almost within sight, a remarkable lesson to all the world of what sanitation will do.

But such results only emphasize the wickedness and folly of neglected sanitary measures. I could name great cities in this country not provided with sewerage; others with bad water supply; and still others paying no attention to insanitary dwellings or overcrowded tenements, with little public sentiment demanding different conditions. Speaking of public sentiment, said Dr. Keene of Philadelphia, in a recent address, and referring to a large atrocity abroad, "The slain and the injured number nearly 1,000. But where has a voice been raised in indignant protest against the massacre of 50,000 persons in the year 1902 in the United States alone by typhoid fever, a preventable disease which ought to be stamped out were a proper water supply and proper sanitary precautions taken. Have you heard any national denunciation of the massacre last year of 150,000 per-

sons in the United States by tuberculosis, a disease which could be reduced to a minimum by proper sanitation?" And referring to the holacust from measles, mumps, chicken pox, scarlet fever and diphtheria, "sometimes called the usual diseases of childhood," he declared, "It is a mark of low grade of civilization that any disease should be 'usual.'"

One hardly knows which to regard the more appalling, the popular ignorance of the masses or the indifference of the intelligent. Safe to say, present popular ideas of sanitary living hold about the same relation to the perfected sanitary state of the future as the sanitary condition of the middle ages holds to that of today.

Notwithstanding the foregoing statements, the work already accomplished, the influences now prevailing, give encouragement. Two forces are at work, voluntary and official. The former consists of societies, congresses, the daily press and current magazines. The voluntary or auxiliary forces are manifest in the great attention paid to engineering, the development of the sanitary expert, by the establishment of sanatoria, the sanitary settlements in our cities, and by the sanitary efforts of labor unions. The life insurance companies are natural allies. They have a direct interest in everything that prolongs the life of the insured, and also collect vital and mortuary statistics. Popular lectures on sanitation are well attended. Certain branches of the national government, although not created in the interest of sanitation, are nevertheless most valuable auxiliaries.

Sometime ago I addressed a circular letter to the proper authorities in the several states, asking information regarding their volunteer and auxiliary sanitary associations. Thirty answers were received. Time will not permit their reading, but their number and wide distribution was a pleasing surprise showing a leaven of sentiment destined to pervade the whole body politic.

LIST.

Following is a summary, in which, however, the names of many societies do not indicate the sanitary work in which they are actually engaged:

California — State, County, and Municipal Sanitary Canference (meets yearly). Anti-tuberculosis League of Southern California.

Connecticut — Bridgeport and Danbury Civic Clubs, composed of ladies. Danbury Good Government Club. Willimantic Women's Club. City and County Health Officers hold occasional joint meetings.

District of Columbia — Society for Prevention of Sickness. Medical Societies. Committees on Public Health of Board of Trade and

Business Men's Association. Committee on Housing Conditions and Committee on Prevention of Consumption of the Associated Charities. Instructive Visiting Nurse Society, which seeks to teach proper sanitary domestic practices.

Illinois — State Board of Health Auxiliary Sanitary Association.

Indiana — Bloomfield Public Improvement Club. Bedford Village Improvement Society. South Bend Progress Club. Farmers' Meetings. And a great many women's clubs throughout the state interested in sanitation.

Iowa — Organization of women to promote sanitary, civic, and æsthetic improvement. Organization of mayors and municipal authorities to promote municipal interests, including sanitation.

Maryland — Public Health Association (400 members) United Women of Maryland. Arundel Club (also women). Baltimore Reform Club. Medical and Chirurgical Faculty — Committee on Sanitation. Maryland State Tuberculosis Commission.

Massachusetts — Association of Boards of Health, which meets quarterly and publishes a quarterly journal. Massachusetts Emergency and Hygienic Association (established 1884) composed of ladies and gentlemen, — gives courses of lectures on hygiene; receives complaints of insanitary houses and assists occupants or owners by coöperating with Board of Health; maintains public playgrounds.

Montana — Helena Improvement Society.

Minnesota — State Sanitary Association.

New York — New York Sanitary Association. Women's Municipal League. Thirty different social settlements. New York Association for Improvement of Condition of the Poor. The nurses' settlement in tenement districts. County medical societies. Committee on Prevention of Tuberculosis of the Charity Organization of the City of New York. Rainy Day Club.

New Jersey — New Jersey Sanitary Association.

North Dakota — Three county medical societies.

Ohio — Conference of state and local boards of health. Ohio Society for Prevention of Tuberculosis. Municipal League.

Oregon — Clatsop County Medical Society.

Pennsylvania — Citizens' Health Institute of Philadelphia (founded 1893). United Charities and Town Improvement Society of Wilkesbarre. Susquehanna River Improvement Association. Associated Health Authorities and Sanitarians of Pennsylvania. The Woman's Sanitary League.

Rhode Island — Commission to establish State Sanatorium for Tuberculosis. Newport Sanitary Association.

South Carolina — Conference of Boards of Health. Ladies' Benevolent Society of Charleston (nearly 100 years old). Ladies' Auxiliary Leagues. Little Sisters of the Poor.

Texas — Civic Improvement Clubs, principally of a sanitary nature.

Vermont — Vermont Sanitary Association. Vermont Association for the Prevention of Tuberculosis.

SANITARY LAWS.

Having thus briefly summarized the auxiliary forces, let us now survey the official forces in active operation. These may be classed as county, municipal, state, and national. These official organizations are the creation of the laws of the land, laws passed in obedience to public sentiment. When public sentiment appears sufficiently crystalized, how then may we best prepare the laws, secure their adoption and their enforcement?

First, regarding national operations. The act of Congress, July 1, 1902, provides for an annual conference between the Public Health and Marine Hospital Service and the State and Territorial health authorities. Our first annual conference was held last June. It was agreed that special committees should be appointed to remain in organization during the year and to receive for consideration matters referred to them from the Service. The findings of these committees are to be reported to and passed upon by the whole conference at the annual meeting. A measure which has thus received the favorable consideration of the conference between the state and national health authorities would naturally be given a great degree of importance; and should it be deemed advisable to embody the same in form for Congressional action the Treasury Department would then pass upon the wisdom of its introduction, viewing it from an administrative standpoint and in the light of all practical and political considerations which present themselves.

Once introduced, the sentiment to support it might be greatly enhanced through the coöperation of the American Medical Association, whose organization under able management has been so perfected that its influence, through its affiliated state medical societies, through their affiliated county medical societies, may be extended to all the members of the Association; and through them to the people and their representatives.

There exists a Legislative Committee of the American Medical Association, which like the medico-political committee of the British Medical Association, passes on proposed national health legislation.

The plan just outlined is already established, and its successful development appears more probable in that coöperation and coördi-

nation of medical influences exist today as never before in the history of our country. Congress is always reasonable when measures offered by the medical profession give evidence of careful thought and of the support of the profession itself.

STATE LAWS.

An equal care in preparing legislation should be exercised by the medical authorities of the states, and like influence utilized for arousing public sentiment.

The growth in number and power of our state boards of health has been continuous until now there is no state or territory without its health organization.

Yet many of our states are backward in sanitary legislation. Their responsibility with regard to municipalities should be more clearly felt. State laws can materially assist effort in the great cities towards tenement house reform and elimination of slums, as well as the establishment in the rural regions of proper sanitation. In granting charters, particularly to new cities, the state legislature has the power to demand compliance with certain sanitary requirements. The first qualification for a new municipal or village charter should be an assurance of its proper sanitation, and the first boast of each new community should be its water supply, sewerage and drainage; churches, school houses and theatres may well come after.

CITIES.

With our great overcrowded cities the subject is apparently more difficult, but the vigorous work of earnest men and women, assisted by good laws created through an aroused public sentiment, is demonstrating the success that may come from apparently hopeless conditions. Tenement house reform is so full of incident and interest as to require an entire evening for its most elementary treatment. The same may be said of the related subject, the suppression of tuberculosis. In the words of the thrice-honored Jacob A. Riis, "From alleys where the sunlight never enters comes that growing procession that fills our prisons; where the sunlight does not enter deeds of darkness naturally belong." "The slum landlord must stop building houses that kill his tenants. Murder is murder whether it is done with an ax or a house."

Mr. Riis himself, and a hundred other writers, might be quoted in support of the direct causative relation between slums on the one hand, and crime, disease, and premature death on the other.

While each large city has its own peculiar problems, I would suggest two thoughts applicable to some, though possibly not to all. One relates to the destruction of insanitary tenements by municipal ordinance. If a landlord has erected a house in violation of the law, or if he fails to equip the house after it is built as required by law, there is no question as to the right of the municipality to demand reconstruction or demolition. But if years ago, houses were erected, whose construction at the time did not violate the law, and now, suddenly, a municipality determines to rise to a higher plane of living, passing ordinances which make these tenements illegal, should not the city consider its own culpability?

Another suggestion relates to the renting tenant. It is very easy to say to the poor tenant, "Depart, your place is not fit for habitation." But where shall he go? Attempts have been made, particularly by the London City Corporation and by the benevolent rich of the United States, to provide sanitary dwellings for the poor. Invariably these are promptly filled on completion, but not with the poor who have been evicted. They, in most instances, have simply moved to other slums.

In my opinion, no eviction of a tenant should be permitted until he is provided with a sanitary dwelling of equal size, and generally to make it sanitary requires *more* space. If economically possible, his rent should not be more than the rent he has been paying for his insanitary quarters. Who is to provide the new tenement? Here is an opportunity for the really philanthropic, — not to give, for alms are not desirable, but to build for investment. This may yield only a small per cent., but it will surely be safe and substantial. This is not giving to the poor; it is simply lending them secured money at a low rate of interest. The good to be accomplished can scarcely be overestimated. Perhaps the poor should not depend upon the rich, and if philanthropic capitalists are not ready to invest it may be the duty of the municipality to give encouragement to others by remission of taxes, concessions, or otherwise. Sanitary tenements are not in the interest of the very poor alone; they are in the interest of the well-to-do. The life and health of every part of a community is affected by the life and health of every other part.

I see no reason why questions of sanitation, particularly the elimination of slums, the requirement of good paving, good drainage, sewerage, light and air for all, and water supply, should not become issues in municipal politics. No more efficient way of educating the people in these matters could be devised than making them the subjects of platform oratory. What more telling speeches could be made than

those appealing to the voters in behalf of their helpless children and in behalf of health-giving conditions?

Popular interest in sanitary reform might be enlisted through the agency of labor unions, which have already manifested their own interests in sanitation and are nearer to the great voting public than any other organized bodies in cities. To awaken the interest of the poor in measures for their own betterment is preferable to seeking the aid of philanthropic millionaires. To my mind it would not be advisable, even were it possible, to induce any multi-millionaire to come into any city to eliminate its slums with his wealth. Such help would be limited to certain cities, and would simply lethargize the individuality and resourcefulness of some poor people and be offensive to others. Municipalities should depend on self-effort.

CONCLUSION.

These agencies suggested for acquiring a higher degree of sanitation, which would mean a higher plane of living, are somewhat different from those usually associated with this work. Heretofore, with the exception of governmental agencies, sanitation has been popularly considered as closely allied with the medical profession and with charity. It is true that those subjects have engaged the attention first of the medical profession, but they are in reality the concern of others as well. In calling attention to them year after year the medical profession gives additional evidence of the unselfish character of its devotion to humanity. In the language of another, "Medical men, for the good of science and a sense of civic pride, have repeatedly carried out investigations in the interest of the public health, and there has never been a time when the medical profession has not been ready and willing to render its services free of charge for the good of the public."

Were it influenced simply for personal profit it would consistently let the matter drop. The profession can continue in its treatment of scarlet and typhoid fever, mumps, tuberculosis, and the whole list of these domestic preventable diseases, and enjoy the occupation. The office of family physician is one of honor and reasonable profit and there is, moreover, a scientific side to it which is of surpassing interest. Therefore, why seek to prevent that which gives this occupation? That no such thought has ever found lodgment in the medical profession lessens in no degree the responsibility for prevention resting upon the public, which primarily and largely benefits thereby. Nor is the work one of charity. Much of the charity of today is but the individual or corporate atonement for the lack of

proper charity on the part of the community. The best charity in any community is a public spirit which will demand the enforcement of proper sanitary laws.

And then again, I would caution you against being placed in the role of reformers. A reformer is too often one who seeks one worthy object and would attain it at the expense of many other objects no less meritorious. Our dependence upon public sentiment, which in the main is correct, and the careful scrutiny of every proposed measure, forefend us against inconsiderate, spasmodic or overzealous action. But we may exhort others in behalf of these measures which will insure to the rich protection from the dangers due to the conditions surrounding the very poor, and which will insure to the very poor sanitary dwellings, pure air, good water, and sunlight in abundance, the God-given blessings of the human race which should be inalienable. There will then be an aristocracy to which all may belong; the aristocracy of sunshine.

ADDRESS OF WELCOME.

By Gen. GEORGE M. STERNBERG, M. D., Washington, D. C.

Members of the American Public Health Association:

Ladies and Gentlemen:— I consider it a privilege to be able to address you briefly upon this occasion and to welcome you to the city of Washington, where we hope and believe you will find all the conditions favorable for a successful meeting of the Association. The attractions of the National Capital are various and great and the public spirited citizens of Washington are always ready to extend a hearty welcome to national organizations, having for their object the betterment of the health, morals, financial prosperity or patriotic zeal of the people of our great republic. I can assure these public spirited citizens, who join with me in extending to you a welcome to the city of Washington, that for twenty-five years the American Public Health Association has been an important factor in promoting the welfare of the people of the United States, not only from a sanitary point of view, but also in the way of national prosperity, for the prevention of disease and the saving of valuable lives contributes to the material resources of the country and greatly increases the value of property in regions subject to invasion by epidemic diseases or to fatal endemic maladies. No doubt the great prosperity of some of the Southern States during recent years depends largely upon the fact that they have been protected from invasion by yellow fever, which formerly prevailed so frequently as to constitute a serious barrier to industrial or commercial progress. It has been estimated that the great epidemic of 1878 caused directly and indirectly a loss of over $15,000,000 to the city of New Orleans alone; and that the loss to the entire section of country invaded by the disease was considerably over $100,000,000. This estimate does not take account of the diminshed value of property and depression of business interests which for several years follow such an epidemic as a result of apprehension that there may be a recurrence of the infliction. Through the persistent efforts of members of this Association this and other exotic pestilential diseases have been practically excluded from the United States for many years; and, through the scientific researches of other members of the Association the methods of accomplishing this end, so far as yellow fever is concerned, have been greatly simplified. Having now an exact knowledge of the method by which the disease is transmitted its prevention has become comparatively easy and sanitarians have no longer any fear

of the recurrence of extensive epidemics of yellow fever within the limits of the United States.

When I look over the list of your past presidents I am reminded of the fact that I am now one of the veteran members of the Association. Among those who preceded me in the presidential chair, which I had the honor to occupy at the Memphis meeting in 1887, all have stars opposite their names but three. The three still living are the veteran founder of the Association, Dr. Stephen Smith of New York, who was president during the first three years of its existence; Dr. John S. Billings of the Army, and Dr. Henry P. Walcott of Massachusetts. The list of those who are now at rest from their labors includes the names of several earnest and illustrious workers in the interests of the public health, whose memories should be kept green by their former colleagues and by the younger members of the Association, to whom they were personally unknown. This is not the time for obituary notices, but I may at least be permitted to mention the names of some of these departed pioneers in the cause of sanitary science and the public health. The list includes the genial Toner of this city, the courtly Cabell of Virginia, the indefatigable Rauch of Chicago, the scholarly Hunt of New Jersey, Harris of New York, Snow of Rhode Island, White of New Orleans, Kedzie of Michigan, Gihon of the Navy and Reeves of West Virginia. These names cannot fail to recall to the comparatively few remaining members of the Association who were their contemporaries, not only the personal appearance and characteristics of those deceased ex-presidents, but the notable meetings of the Association held under their official direction. I recall especially the Richmond meeting in 1878, presided over by Dr. Elisha Harris of New York and at which Prof. James L. Cabell of the University of Virginia, was elected president. I took the journey from Fort Walla Walla, Washington, to Richmond, Va. to attend this meeting, and this journey included a stage ride of 500 miles through the desert, from Walla Walla to the nearest point on the Union Pacific Railroad. The recent devastating epidemic of yellow fever, in the states of Louisiana, Mississippi, Alabama and Tennessee, gave the subject of the etiology and prevention of this disease unusual prominence at the Richmond meeting and led to action by the Association resulting in our first national health legislation; viz, the establishment of a National Board of Health. The American Public Health Association naturally took a deep interest in its offspring and regarded the early demise of this national board of health with grave concern. In the light of experience it must be admitted that there were elements of weakness in the organization of this board, not pertaining to its personnel but due to the fact that its members were widely scattered and

were only expected to give a small portion of their time and talents to the matters committed to their charge. However, the first step in securing national legislation in a new direction is always the most difficult, and the American Public Health Association may well congratulate itself upon having been successful in taking this first step; and upon the fact that by subsequent legislation a national public health service has been established upon a solid basis and is under the direction of the man to whose energy and diplomacy we are indebted for this result.

The Association is also to be congratulated upon the scientific research work which is being done by its members and under its auspices. The committee on disinfectants of which I had the honor to be the chairman, took the initiative in this line of work and made elaborate reports, which will be found in the annual volumes published by our Association for the years 1885, 1886 and 1887. The research work carried out by this committee aided greatly in establishing the practice of disinfection upon a reliable scientific basis and its conclusions and recommendations have stood the test of time and experience. The more recent organization of the members of the Association engaged in research work into a "Section of Bacteriology and Chemistry" has been of great advantage to the interests of sanitary science and offers much encouragement for future progress in this important field of investigation. Our Association has a noble record of work accomplished and a broad field for future efforts in behalf of the public health. Although cholera and yellow fever and bubonic plague are no longer feared by sanitarians, we have not yet conquered our endemic filth disease, typhoid fever; and tuberculosis still claims nearly 150,000 victims annually within the limits of the United States. Until these and other widely prevalent infectious diseases are practically stamped out our self-imposed task will not be complete; and even then it will be necessary to constantly enforce the lessons gained by past experience to prevent a return to insanitary conditions and the penalties in the way of sickness and death which are inevitably associated with such conditions.

The fact that the American Public Health Association has held its annual meetings in the principal cities of the continent, including the Dominion of Canada and the Mexican Republic has constituted an important factor in its usefulness. The papers and reports read; the discussions upon these; and the publication of the proceedings by the local press serves to bring the attention of the public to public health matters and to renew interest in questions relating to local sanitation.

In Washington there is still much to be accomplished in the way of sanitary improvements, the necessity for which is generally recognized

Our sewer system is incomplete and in the alleys of the city there are many houses which have no sewer connections and no water supply, except from a street hydrant. These alley houses, occupied principally by the more ignorant class of the colored population, are usually overcrowded and are the hot-beds of vice, immorality and disease. The high death rate from typhoid fever, tuberculosis and diphtheria, and the excessive infant mortality, among this class of the population gives to the nation's capital a mortality rate which does not compare favorably with that of many other cities in this country or of the great capitals of Europe. A law for the condemnation of insanitary houses is urgently needed. Our sewer system should be pushed to completion and our health department should have the authority and the money necessary for the sanitary reclamation of these plague spots which disgrace our otherwise beautiful and healthful city. We are dependent upon the Congress of the United States for the legislation and appropriations necessary to accomplish these results; and we earnestly appeal to you, individually and as an Association, to use your influence in behalf of this important sanitary work.

ADDRESS OF WELCOME.

HON. H. B. F. MCFARLAND,

PRESIDENT OF THE BOARD OF COMMISSIONERS OF THE DISTRICT OF COLUMBIA.

Mr. President, Members of the Association, Ladies and Gentlemen:

I am honored to-night with the very grateful office of offering you an official welcome to the National Capital. Those of you, who do not live here, perhaps do not know that we have a government of the District of Columbia and an executive government under the legislative authority of Congress, which is our legislature for our legal purposes. This executive government is composed of three commissioners, and it is in their behalf I stand before you for a few moments to offer you the welcome of the government of the District of Columbia. It will interest those of you, who are connected officially with state or municipal governments, to know that this executive government has a combination of state and municipal functions, and that all measures local to the District of Columbia respecting public health are under the general supervision and direction of the Commissioners. Therefore, we have a deep personal as well as official interest in your deliberations, and in your results, and we are especially cordial in the greetings which we offer you. We offer you our congratulations upon being here. In the course of the many years of history of the Association, I do not believe that you have met anywhere else with more pleasure than you have met in Washington. I am sure, every year you return here you will find it more attractive and more delightful. I am also sure, we shall be glad to have you return just as often as you will.

The weather bureau, for which we take no credit, has given its best weather for this occasion, and while the spring is more beautiful than the fall here, as elsewhere, still we think Washington looks attractive just now.

I do not need to say to any of you how large the opportunities are here for your special study and for the observation of those things which are of special interest to you. I do not need to tell you anything of the attractions of the National Capital. It is very fitting, it seems to me, that you should assemble here, as Washington is distinguished from all other capitals, not only by the United States of America, but by the Dominion of Canada, the Republic of Mexico, and the Republic of Cuba. It is the seat of the government of the United States, which has shown special zeal to promote the public health of all

America, and it is the headquarters of the Public Health and Marine Hospital Service, which, with the affiliated state services, represents the most advanced progress of this governmental effort. The head of that Service is the President of your Association. You do not need to be told how successful the work is that is being done. Moreover, we of the District of Columbia have, we think, peculiar claims upon your interest just now in the great enterprises for the improvement by filtration and otherwise of our water supply, and of the care of our sewage wastes, with all their dangers, by a new system of sewage disposal. We hope also for your interest in the special effort which we are making to secure legislation which will enable us to meet the untoward conditions in our slums, which, as General Sternberg told you this morning, are in our alleys. We are fully alive to the dangers of them. Our whole community has been awakened to that subject within a recent time. Many of our prominent citizens, who did not know what was going on in the alleys and squares in which they live, were shocked by the sights which they saw, and were brought to a realization of the need of legislation which would enable the Commissioners to cope with this particular danger. We have power to tear down dilapidated houses, but not to tear down unsanitary houses. We have not the power as yet to sweep away, in this battle with the slums, the enemy which we so plainly see and so greatly fear. The Commissioners asked last year and the year before, and we shall ask again this session, for the legislation necessary. We shall be glad if you will speak to your senators or representatives that we may have the power we need for this very vital purpose. We are making vigorous efforts to improve and protect the health of the people of the National Capital continually, and for that purpose we have a health department, at the head of which is the chairman of your local committee of arrangements, Dr. Woodward.

During the past year we have accomplished among other things much towards the better management of tuberculous cases, chiefly by educating public opinion, and have prohibited and practically stopped, and without a single arrest, expectoration on the sidewalks and in the street cars and other public places. We realize fully here that the health of the people is the first duty of the statesman, and that all else that can be done for the capital or for any other capital goes for nothing if its health is not protected and promoted.

We believe the meeting of your Association here will be of great value to the countries you represent, but especially to the States now absorbing annually an increasing proportion of the population. We believe that the emphasis which you put upon sanitary reform is of the highest significance and importance, and we look to you for new

and practical advice and assistance in the solution of our own problem. We of this Capital, which seems to us so beautiful as to exact our deepest loyalty, rejoice also that in our desire to have it made more and more beautiful, we have the sympathy of all intelligent visitors and the support of our intelligent countrymen. But we know that it cannot be really beautiful unless it has the beauty of holiness, that is, the holiness of health, physical and spiritual. Be clean within and without, the first words of religion, are the last words of science. In obedience is life; in disobedience death.

The Republic of Cuba, which by a happy coincidence is first represented in your convention in the city of Washington to-day, has our special welcome; brought as she was into the family of nations through the unexampled effort and under the fostering care of our own Republic, she illustrates impressively the value of health to the State. Freed from the dominion of Spain by the heroes and martyrs of our army and navy, Cuba was freed from the more terrible and costly dominion of disease by the heroes and martyrs of sanitary reform. Once she was not only miserable herself, but a terror to her neighbors. We suffered so much at one time from that awful pestilence, yellow fever, that the late Mr. Blaine said it would be better to purchase the island simply to stamp out that plague. Cuba rejoices now no more in her own deliverance than in the deliverance of her neighbors from that danger. Here and everywhere similar deliverances must be wrought by patient, self-sacrificing, and public-spirited endeavor. We take inspiration and courage for our work from what you and those whom you represent have done. (Applause.)

REPORT OF THE COMMITTEE ON ANIMAL DISEASES AND ANIMAL FOOD.

By D. E. SALMON, D. V. M., Chairman, Washington, D. C.

Your committee on animal diseases and animal food has the honor to make the following report with reference to tuberculosis, and regret that the time at the chairman's disposal has not permitted the inclusion of other subjects which are, also, of great interest at this time.

In the last two reports presented by this committee considerable space was devoted to the subject of tuberculosis, and particularly to that phase of it which relates to the transmission of the disease from animals to man. It was shown from a review of the facts obtained by different methods of inquiry that the clinical evidence, the evidence of statistics, and the evidence from experimental researches all favored the conclusion that animal tuberculosis was a factor in the causation of human tuberculosis, and it was held that sanitarians should advocate and enforce measures to prevent the transmission of the disease from animals to man. This question is so important and so much uncertainty has been caused by the paper presented at the British Congress on Tuberculosis by Koch and by his subsequent address at the International Conference on Tuberculosis at Berlin that it is deemed advisable to continue the discussion in the present report.

The fact that tubercular material from human subjects often failed to produce serious disease in cattle was observed by a number of the earlier investigators who experimented with such virus. It was the experiments and comparative studies of Theobald Smith, however, which attracted special attention to the difference in virulence shown by tubercle bacilli from human and bovine sources when inoculated upon cattle. Smith, also, mentioned certain morphological and cultural differences in bacilli from these two sources, and in the location and histology of the lesions in cattle produced by such bacilli. He did not conclude, however, that bovine bacilli could not produce disease in the human subject, but said: "It seems to me that, accepting the clinical evidence on hand, bovine tuberculosis may be transmitted to children when the body is overpowered by large numbers of bacilli, as in udder tuberculosis, or when certain unknown favorable conditions exist."

Koch, however, in his address at the British Congress on Tuberculosis, went far beyond this and maintained that "human tubercu-

losis differs from bovine, and can not be transmitted to cattle." As to the susceptibility of man to bovine tuberculosis, he said it is not yet absolutely decided but one was "nevertheless already at liberty to say that, if such susceptibility really exists, the infection of human beings is but a very rare occurrence." He emphasized this view in the following language: "I should estimate the extent of infection by the milk and flesh of tubercular cattle, and the butter made of their milk, as hardly greater than that of hereditary transmission, and I therefore do not deem it advisable to take any measures against it."

This conclusion was so radically different from the views of most experimenters, and so out of harmony with facts which had apparently been demonstrated by others that it at once aroused opposition in the Congress, followed by the adoption of dissenting resolutions, and led to numerous investigations in various countries. Koch's conclusions were based upon his failure to produce tuberculosis in cattle and other animals by inoculating them with tubercular material of human origin, and his success in causing progressive and fatal tuberculosis in the same kinds of animals when inoculated with tubercular material of bovine origin. With such positiveness did he hold to the constant and specific difference between the human and bovine bacillus that he promulgated an experimental method of discriminating between them. Speaking of the etiology of intestinal tuberculosis in man he said: "Hitherto nobody could decide with certainty in such a case whether the tuberculosis of the intestine was of human or of animal origin. Now we can diagnose them. All that is necessary is to cultivate in pure culture the tubercle bacilli found in the tubercular material, and to ascertain whether they belong to bovine tuberculosis by inoculating cattle with them. For this purpose I recommend subcutaneous injection, which yields quite specially characteristic and convincing results."

These important and comprehensive conclusions followed from a comparatively few experiments upon animals, and apparently no effort had been made to learn to what extent human tubercle bacilli might differ in their virulence for cattle or what grades of virulence there might be among bacilli of bovine origin. Vagedes had already shown that bacilli were sometimes present in human lesions which were as virulent as bovine bacilli, but his work was wholly ignored by Koch. In the preceding report of this committee reference was made to the work of Ravenel, de Schweinitz, Mohler, de Jong, Delepine, Orth, Stenstrom, Fibiger and Jensen, Max Wolff, Nocard Arloing, Behring, and Dean and Todd, all of whom found tubercle bacilli in human lesions which proved to have about the same virulence for cattle and other animals as had the bacilli from bovine ani-

mals affected with tuberculosis. Since that report was presented Theobald Smith has reported the finding of a human bacillus virulent for cattle, and there has been made a preliminary announcement by Kossel of the results obtained by the German tuberculosis commission. The statement of Kossel should be given the most careful consideration, coming from a commission appointed upon Koch's recommendation, and evidently inclined to favor his views as far as possible in its report.

Kossel stated that the commission had tested seven cultures of tuberculosis from cattle and swine, four of cattle and three of swine. Two of these cultures proved acutely fatal in cattle after eight to nine weeks; four of the cultures likewise produced a generalized tuberculosis, but which certainly had a more chronic course; while one of the cultures caused only an infiltration at the point of inoculation, with some caseous foci in the adjoining prescapular gland and in one of the mediastinal glands, and there was lacking the spreading of the tuberculosis over the entire body which they were accustomed to see after the injection of cultures of bovine tuberculosis. "Hence," says Kossel, "among bovine tuberculosis bacilli there can also occur differences with regard to the virulence."

The German commission also tested thirty-nine different, freshly-made cultures from tuberculous disease in man. Nineteen of these cultures did not produce the slightest symptoms in cattle; with nine others the cattle exhibited after four months very minute foci in the prescapular glands which were mostly encapsuled and showed no inclination to progress; with seven other cases there was somewhat more marked disease of the prescapular glands, but it did not go so far as a material spreading of the process to the glands next adjoining; there were four cultures, however, which were more virulent and caused generalized tuberculosis in the cattle inoculated with them.

It would appear, therefore, that hereafter even Koch must admit that it is impossible to always tell the source of a culture of the tubercle bacillus by its effect when it is inoculated upon cattle. One of the bovine cultures failed to produce generalized tuberculosis in cattle and some of the human cultures did produce this form of the disease in such animals; moreover, while some of the human cultures caused no disease at all, others led to the development of minute foci in the prescapular glands, and still others to somewhat more marked disease of these glands. There were, consequently, four degrees of virulence noted in these thirty-nine cultures of bacilli from human sources and three degrees of virulence in the seven cultures from animal sources. Now, if we accept the views of Koch as to

the specific differences between human and bovine tubercle bacilli, and that the human bacilli produce only localized lesions in cattle while bovine bacilli produce generalized lesions in these animals, must we not conclude that the one non-virulent bovine culture was in reality of human origin and that the animal from which it was obtained had been infected from man? This is a logical deduction, but reverses the dictum laid down at London that human tuberculosis is not transmissable to cattle. Again, how are we to explain the human cultures of medium virulence? Are they human bacilli which for some unknown reason are increasing in virulence and approaching the activity of the bovine bacillus? or are they really bovine bacilli which have multiplied in the human body until their virulence has become attenuated? In whatever manner these questions are decided, it would seem that the findings of the German commission, instead of supporting Koch's views that we can decide with certainty by the inoculation of cattle as to the source of any given bacillus, really show that this method of diagnosis is extremely uncertain in the present condition of our knowledge.

It is definitely admitted that four of the human cultures caused generalized tuberculosis in cattle; but Kossel suggests that it might be possible that the bacilli in cases of human tuberculosis under certain circumstances could likewise attain a very high pathogenic activity for cattle without being for that reason bovine bacilli. Undoubtedly, the German commission is confronting the two horns of a dilemma, either one of which is fatal to the views of Koch as stated with such positiveness at London. If we accept this suggestion thrown out by Kossel, we must conclude that Koch was wrong in his claim that human tuberculosis can not be transmitted to cattle, and thus with one blow we destroy the entire experimental support which he had for his argument before the British Congress on Tuberculosis. And if, on the other hand, we accept the conclusion which follows from the principle laid down by Koch for the discrimination between human and bovine bacilli, and which appears to be favored by Kossel, we must admit that bovine tuberculosis is an extremely important factor in the etiology of human tubercolosis. Of the thirty-nine cases of human tuberculosis tested, four, or over ten per cent, were virulent for cattle and would be classified as of bovine origin; but these four cases were all found among the sixteen cases of tuberculosis in children which the commission investigated, hence, it is plain that 25 per cent. of the cases tested of tuberculosis in children would by Koch's method be classified as of bovine origin.

In the Bureau of Animal Industry two distinct lines of experiiments have been carried on, in order that one might serve as a check against the other. There has been, however, no discrepancy in the results. De Schweinitz, in the Biochemic Division, has isolated nine cultures from human tuberculosis. Two of these were derived from human sputum, three from cases of generalized tuberculosis in adults, and four from cases of generalized tuberculosis in children. By comparing these cultures with a newly isolated virulent culture of bovine tuberculosis, there were found among them two cultures from children which were identical in their cultural and morphological characters with the bovine bacillus. These cultures also killed rabbits and guinea pigs in a short time, as did the bovine bacillus. Hogs which were inoculated subcutaneously with these two cultures from children died of generalized tuberculosis. Two calves, weighing over 300 pounds each, were inoculated subcutaneously with these virulent human cultures and as a result developed generalized tuberculosis. A yearling heifer inoculated with one of the cultures showed generalized tuberculosis when killed three months after inoculation. Both the cattle and the hogs had been tested with tuberculin and found to be free from tuberculosis before the inoculations were made. It is important to observe in this connection that two out of four, or fifty per cent. of the cultures obtained from cases of generalized tuberculosis in children proved virulent for cattle.

Mohler, working in the Pathological Division, has obtained three very virulent cultures of tubercle bacilli from the human subject. A goat inoculated subcutaneously with one of these cultures died in thirty-seven days with miliary tuberculosis of the lungs involving the axillary and prescapular glands. This bacillus was obtained from the mesenteric gland of a boy. Of still greater interest is a bacillus isolated by Mohler from human sputum. A goat inoculated subcutaneously with a culture of this germ died in ninety-five days of pulmonary tuberculosis. A cat inoculated in the same manner died in twenty-three days of generalized tuberculosis. A rabbit similarly inoculated died in fifty-nine days of pulmonary tuberculosis. Another rabbit inoculated with a bovine culture for comparison lived ten days longer than the one inoculated with this sputum germ. Mohler also inoculated subcutaneously a one-year-old heifer with a culture derived from the tubercular mesenteric gland of a boy four years of age. This culture was always refractory in its growth under artificial conditions, and the bacilli were short, stubby rods corresponding in appearance with the bovine type. At the autopsy, held 127 days after the inoculation, the general condition was seen to be

poor and unthrifty and large, hard tumors were found at the points of inoculation. On the right side, the swelling measured 3½ by 5 inches and the corresponding lymph gland was 2¾ inches long by 1¾ inches in diameter. This gland contained numerous calcareous foci, one of these at the apex was an inch in diameter. The lesions on the left shoulder of the animal were very similar to those found on the right side, but the dimensions of the tumor were slightly less. The lungs presented an irregular mass of tubercular nodules, and seven or eight grape-like nodules were seen on the parietal pleura. Bronchial and mediastinal lymph glands contained numerous tubercular foci and the pericardium, peritoneum, spleen and liver were also affected.

In order to throw some light, if possible, upon the morphological constancy of the different types of tubercle bacilli, Mohler was requested by the chairman of your committee to make comparative studies of bacilli from various sources, and which had been passed through various species of animals, by making the cultures upon dog serum after the method described by Theobald Smith. Some important results have been obtained. One culture of human bacilli which had morphological and cultural peculiarities similar to those of the bovine bacillus, and which only produced local lesions in cattle, was passed through a series of five cats. It was then found to be completely changed in its morphological characters, the rods being elongated, slender, more or less beaded and entirely of the human type. But far from decreasing in virulence, as might be expected from its morphological appearance, this bacillus had so increased in its pathogenic activity that it now produced generalized tuberculosis in a cow. This cow was inoculated subcutaneously in front of each shoulder with two c.c. of a salt solution emulsion of the tuberculous omentum of the last cat of the series. The cow rapidly lost flesh, had a temperature of 104° F., with the point of inoculation and adjacent glands greatly swollen. The autopsy revealed generalized tuberculosis, involving the lungs, mediastinal glands, spleen, liver, and kidneys. Tubercle bacilli of the bovine type obtained from the mesenteric glands of a sheep, hog, and cow were similarly transformed in their morphological appearance after being passed through a series of cats and recovered on dog serum. These bacilli also increased in virulence as the last cat in the series invariably succumbed in a shorter time than the first of the series.

These experiments and observations indicate that the types of tubercle bacilli are very inconstant, and that under suitable conditions they readily change both in morphology and in virulence. A similar conclusion was reached by other investigators in working with

the avian and piscine types of tubercle bacilli several years ago, and was reasonably to have been expected with the human and bovine types.

It must be plain to all, from these recent developments, that too much has been made of the slight differences in cultural characteristics, in morphology, and in virulence which have been observed in some cases in comparing the human and the bovine bacilli. The observations were interesting and it was important that they should be followed up until their significance was made entirely clear; but it was an almost unpardonable error, from a sanitary point of view, to promulgate sweeping generalizations, calculated to arrest and abolish important measures for preventing human tuberculosis, before the soundness of these generalizations had been established by a thorough course of experimentation.

When Koch said in the British Congress on Tuberculosis that he should estimate the extent of infection by the milk and flesh of tubercular cattle, and the butter made of their milk, as hardly greater than that of hereditary transmission, and that he therefore did not deem it advisable to take any measures against it, he went far beyond what was justified by any experiments or observations which he reported, and he did an immense amount of harm which will be manifested for years to come to those who endeavor to guard the human race from the dangers of animal tuberculosis. The researches to which your committee has alluded make these dangers more definite and certain than they have appeared before, and sanitarians should therefore most earnestly endeavor to counteract the erroneous and harmful impression which was made by Koch's address at London and his subsequent address at the International Conference on Tuberculosis at Berlin.

Now that the conclusions of the London address are shown to be incorrect and based on insufficient experimentation, it is well that some attention should be given to the Berlin address in which certain rules were laid down for testing all clinical evidence before it can be accepted as indicating the transmission of tuberculosis from animals to man. While your committee agrees that it is advisable to scrutinize clinical evidence as carefully as possible before it is accepted as influencing the decision of such an important question, consistency demands that we should accept clinical evidence bearing upon the transmission of bovine tuberculosis to man on the same terms that we accept evidence bearing upon the transmission of tuberculosis from man to man. For instance, Koch said in his London address, "So the only main source of the infection of tuberculosis is the sputum of consumptive patients." How does he know this? Has he any evidence

to support this conclusion which will stand the requirements which he has laid down for those who oppose his views with reference to the transmission of animal tuberculosis to man? If so, this evidence has not yet been presented. Your committee believes that the principal source of tuberculosis in man is infection from other tuberculous human subjects, but it also believes that a considerable proportion of the cases of tuberculosis in man is due to infection from animal sources; and in weighing the evidence by which we are to fix more rigorously the relation which these two sources of infection bear to each other, it is logical that we should apply the same rules of evidence in each case.

The rules which Koch formulated for testing the evidence as to bovine infection are given below, with such brief comments as your committee feels they deserve.

1. Certain proof of tubercle, and where possible the primary focus must be supplied.

To this condition no objection is raised, but it should be remarked that the location of the primary focus, which is made so much of, is of little value in determining the origin of the infection. It has been clearly shown by various investigators, whose work has been referred to in the preceding reports of this committee that tubercle bacilli may pass through the walls of the intestine without producing any lesion at the point of entrance, and that their first point of lodgment and multiplication may be the mesenteric glands, the liver, spleen or even the lungs. On the other hand, Koch has told us that the location of the primary lesion in the intestine is of no significance because human as well as animal bacilli may be swallowed and may be the cause of such lesions. It is, therefore, not at all apparent that this is an essential point.

2. Other sources of infection must be excluded with certainty.

This condition appears to exclude all clinical evidence bearing upon the source of tubercular infection. How is it possible to prove that any given individual has not been exposed to the bacilli of human tuberculosis? And, for the same reason, how is it possible to prove that any given individual has not been exposed to the bacilli of animal tuberculosis? It may be said that this consumptive person had habitually been in a room with another consumptive patient and was infected from that patient. But how can you prove that this person never ate any tuberculous meat, never partook of any tuberculous milk, never ate any butter containing the tubercle bacillus, never had opportunity to be indirectly infected from the hands of cooks or from table utensils which had been in contact with tuberculous meat, milk, or butter, and was never exposed to the infection scattered in so many ways by

tuberculous animals. It is impossible to exclude with certainty all these sources of infection, and if we apply the condition under discussion to the evidence upon which Koch based the assertion that the main source of the infection of man is the sputum of consumptive patients we would find no part of it that would stand the test. Now, is it logical to accept clinical evidence, as to the transmission of tuberculosis from man to man, by one set of rules, and to require an entirely different set of rules when considering evidence as to the transmission of the same disease from animals to man? Your committee is of the opinion that clinical evidence should be regarded as valuable in confirming experimental researches, or in indicating the probable facts where experimentation has been insufficient or is impossible, but that it is too much to expect that clinical evidence will be forthcoming as to the transmission of tuberculosis which will exclude all possible sources of error.

3. In each case of alleged infection from milk affected with bovine tuberculosis the condition of the rest of the people who have taken the same milk should be borne in mind. These fellow-consumers form to a certain extent a control experiment, and if of the numerous people who have drunk the suspected milk only a single one sickens, this weighs decidedly against the belief that this one person was infected by the common food.

This condition, also, is regarded by your committee as illogical and impossible of general application without discarding all clinical evidence upon this question. If we apply it to the alleged cases of sputum infection, we find it is seldom, indeed, that the disease of more than one person can be traced with any probability to the same tuberculous patient, although scores of persons may have been exposed to that patient. Most people who escape tuberculosis have nevertheless been exposed many times to tuberculous patients, but this is not sufficient reason for concluding that others have not contracted the disease by similar exposure. Tuberculosis is a disease which is communicated with such difficulty among people under ordinary conditions of life, either by exposure to diseased persons or to tuberculous food, develops so slowly, and varies so much in the period which elapses before symptoms are observed that it is only very rarely that groups of cases are observed which even appear to have originated from the same source. And yet, how erroneous it would be to exclude clinical evidence suggesting contagion because only one of those exposed to a certain consumptive had contracted the malady.

4. The source of the milk should be attended to. Since in recent years it has become more and more evident that milk containing tuber-

cle bacilli is yielded only by such cows as suffer from tuberculosis of the udders, the general statement that some one has drunk milk from a cow suffering from tuberculosis no longer suffices to prove to us that bovine tuberculosis bacilli have really reached his digestive organs. It must be from a cow with tuberculosis of the udder, and therefore a statement on this subject should not be wanting in a report on milk infection if it is said to be complete.

Your committee finds this statement of fact to be incorrect, since the tendency of recent investigations by competent persons is to make it more and more evident that cows with tuberculosis may yield milk containing tubercle bacilli when the udders present no signs of the disease. The argument is, therefore, antiquated. Of the many experiments that have been made to determine the proportion of tuberculous cows which yield infectious milk, the average results are about 15 per cent, while the cases of tuberculosis of the udder are about two per cent. In recent investigations made by Mohler of the Bureau of Animal Industry with fifty-six reacting cows, it was found that twelve of these, or 21.4 per cent, at one time or another during the experiment gave milk which contained virulent tubercle bacilli. Undoubtedly cows with tuberculosis of the udder yield milk containing a larger number of tuberculosis bacilli than do those in which the udder remains unaffected and are, therefore, more dangerous, but it has been clearly shown that other tuberculous cows may yield virulent milk.

So much for the conditions laid down by Koch for testing clinical evidence bearing upon the transmission of tuberculosis from animals to man. The effort to rule out all such evidence by applying impossible tests does not meet with our approval, but fortunately clinical evidence is no longer necessary for deciding the question. The subcutaneous injection of cattle with pure cultures of the tuberculosis bacillus from human sources, which according to Koch "yields quite specially characteristic and convincing results," has proved, in the hands of the German commission no less than in those of independent investigators, that bovine tuberculosis is communicable to man. It will require much work to decide with even approximate accuracy the proportion of human tuberculosis caused by animal infection; but the fact that 25 per cent. of the cases in children investigated by the German commission, and 50 per cent. of similar cases investigated by de Schweinitz showed by this test that they were caused by animal infection is sufficient to convince us that measures should be taken and enforced at once to guard against infection from this source.

In concluding your committee desired to express its appreciation of the prompt, intelligent, and indefatigable work of those scientific investigators who took up this question immediately after it was brought to the front at London, and in the comparatively short period of about two years have furnished the material for definitely settling it, so far as the principal contention is concerned.

THE RELATION BETWEEN HUMAN AND BOVINE TUBERCULOSIS.

By MAZYCK P. RAVENEL, M. D., Philadelphia, Pa.

Mr. President and Gentlemen:— The importance of this subject is so well known to you, and the matter has been so admirably presented by Dr. Salmon in his report read yesterday, that I will not detain you with preliminary considerations, but will plunge at once *in medias res.*

We will take up the subject from three standpoints: First, direct experimental transmission of tuberculosis from man to animals; second, clinical evidence of its transmission from animals to man; and third, theoretical considerations. In that order I will discuss the subject.

First. The transmission of the disease from man to animals is susceptible of direct experimental proof, and it will take but a few minutes to dispose of this phase of the subject. Chauveau was the first in 1868 to prove the possibility of infecting cattle with tuberculosis from man. His experiments were carried out on animals selected from the Jura Mountains where tuberculosis was not known. Consequently the objection which has been raised that these cattle were possibly not free from tuberculosis because the tuberculin test had not been made, does not hold good. Tuberculin had not been discovered at the time of these experiments, but Chauveau took the precaution of selecting his animals from a district in which tuberculosis had never been known, just as at the present time in certain districts in our own country no case of tuberculosis has ever been seen. In 1879, Bollinger succeeded in transmitting tuberculosis of man to cattle, and of others who have made similar experiments I may mention Klebs, Crookshank, Kitt, Sidney Martin, and more recently since the publication of Koch's paper in 1901, Thomassen, Nocard, de Jong, Arloing, Westenhoffer, Max Wolff, Schottelius, de Schweinitz, Febiger and Jensen, and Hamilton and Young. At the laboratory of the State Live Stock Sanitary Board of Pennsylvania we have also succeeded repeatedly in transmitting human tuberculosis to cattle. These experiments were done before the publication of Koch's paper, and most of them reported at the London Congress in 1901.

I may single out from this list the experiments of Hamilton and Young, which have just been published. They began with twenty (20) calves, one (1) of which died during the preliminary period of observation from some inter-current affection. Nineteen (19) were inocu-

lated with human material, and of these, fifteen (15) developed tuberculosis, while four (4) resisted the inoculation. The diagnoses in all fifteen (15) of these cases were made by macroscopic and microscopic examinations as well as by the re-inoculation of guinea pigs. Lastly, in this connection we have the report of the Commission of the Imperial Sanitary Office of Germany, which will be considered later at greater length. Out of sixteen inoculations made with material taken from children they succeeded in producing tuberculosis in cattle four times, or twenty five per cent. In other words, in one quarter of all cases of tuberculosis in children examined by them, they succeeded in transmitting the disease to cattle.

The second phase of our subject is the consideration of transmission of tuberculosis from cattle to man, and here we are deprived of the benefit of direct experimental evidence. We have, however, a number of cases in which accidental inoculation has taken place, some of which have ended in general infection followed by death. I have myself had four such cases come under my observation, two occurring in an assistant in my laboratory. In both of these cases the source of infection was known to be bovine, which was further proven by the excision of the lesion, the inoculation of guinea pigs and the isolation of the bacillus in pure culture. I have here a photomicrograph of a section taken from one of these cases. In addition to this cases have been reported by Krause, Troje, Spronk and Hofnagle, Lassar, Tschering, Pfeiffer, Hartzell, Kurt Muller, de Jong, Joseph and Trautman. I will give the details of only one of these, namely, the case reported by Troje which is one of the most typical and is able to bear the most severe criticism. The journals report that this case was submitted to Koch who agreed that there was no point lacking the evidence.

A young butcher in good health, and with no hereditary taint, wounded his left fore arm slightly while working on a tuberculous cow. The wound healed under treatment, but six weeks later showed signs of inflammation, and a tubercle formed on the internal face of the elbow. There were two small fistulae on the forearm, and enlargement of the ulnar and axillary lymph glands. A month later the middle forearm was covered with granulations which steadily increased in area, and in spite of treatment, at the end of two months assumed the character of lupus. Histologic examination at this point proved the tuberculous character of the disease. Two years after the injury Troje found an abscess which extended into the deep muscular layers. The pus contained tubercle bacilli, and the tissues showed typical tuberculous lesions. Some months after the glands of the left axilla and sub-clavicular space were extirpated, and proved to be tuberculous.

All possibility of infection from human sources was excluded by Troje.

The second consideration under this head is inoculation by ingestion. It has been proven repeatedly by experiments that ingestion is an easy way in which to infect animals, and we have good evidence that in mankind this mode of infection occurs also. It must be admitted however, in our clinical cases that all of them have some defect, inasmuch as we can not exclude positively all other sources of infection. In regard to this however, the evidence is as good as that we have in many cases which we admit to be by inhalation. It is generally accepted by all who have worked along these lines that inhalation of dried sputum is the chief source of infection from man to man, yet if we demand strict proof of this very little positive evidence can be adduced. Of the cases of clinical infection through feeding which have passed into literature, I may mention those of von Ruck, Stang, Demme, Gosse, Ollivier, Law, Ebers, Bang and Rievel;—thirty-eight cases in all, where the evidence is very direct and very strong. One of these cases reported by Gosse of Geneva, is so convincing that Nocard has well said, "It has almost the value of an experiment." Gosse was a physician himself, and the son of a physician. His own daughter was infected by drinking the milk from a cow with tuberculosis of the udder on his own farm, and he had the remarkable courage to perform a postmortem and give the results to the scientific world.

Directly in the line with infection by ingestion comes the consideration of postmortem evidence, which is somewhat contradictory. In England, for instance, we have a general average of primary intestinal tuberculosis of something over 25%. In London, Guthrie reports at the Children's Hospital at Paddington, 24.6%; Still at the Great Ormond Street Hospital 23.4%; Shennan at the Royal Hospital at Edinburgh, 28.1%. In Germany, according to Koch's figures the average is very low, but it must be said that he has not so far given a fair consideration to the available evidence. We have the report of Heller, of Kiel, who while he found only 1.43% of primary intestinal tuberculosis, found 37.8% in which the principal lesion was in the intestine, the mesenteric gland or the abdominal organs, so we may conclude that all of these were cases of intestinal infection. Furthermore, Prof. Hueppe, of Germany, states that the percentage of primary intestinal tuberculosis in Germany varies from 25 to 35% of all children dying of tuberculosis. We have also the figures given by von Hanseman of Berlin, who states that he has seen twenty-five cases of intestinal tuberculosis during seven years, and considers it much more common than is generally believed.

In America we have not a great collection of figures on this point, but with perhaps a single exception those at hand indicate a much smaller percentage of primary intestinal infection. This difference in different countries and in different parts of the same country is no doubt due in part to a difference in local conditions, but is more largely due perhaps to the method of observation and the interpretation of results. The finding of the oldest lesion in the lung does not in my opinion at all indicate that infection was through the respiratory tract. In our work at the laboratory of the State Live Stock Sanitary Board, we have been repeatedly struck with the extensive involvement of the lung in cases which were infected by feeding, when the intestine of the same animal showed either very slight lesion or no lesion whatever. I show you here a photograph of lung and intestine of a monkey which was one of a series in a comparative experiment. The intestine is absolutely free from any change, and yet the lung is riddled. Ninety-nine pathologists out of a hundred would have said that this case was one of primary respiratory infection yet this monkey was kept under such conditions that made infection by this means impossible, and was tested with tuberculin before the experiment began. The explanation was found in the fact that infection took place through the tonsils, as the cervical lymphatic glands showed enlargement and caseation. I show also another photograph of the lung of a cow also infected by feeding. You will observe that this lung shows enormous cavities and extensive consolidation, yet the intestine of this animal was absolutely normal throughout.

I am prepared to go even further than this, and hold that even when infection takes place through the intestine we may have the first and oldest lesion show itself in the lung. The late Prof. Nocard while collecting serum from horses for culture medium found that if he drew his blood at certain periods of digestion his serum would become contaminated, even if he divided it into small lots of 100 c.c. each. On the other hand, if he collected the blood during fasting he could preserve his serum in liter flasks without the loss of a single one. In seeking an explanation for this two of his assistants Desoubry and Porcher found that if they fed dogs with soup containing a considerable amount of greasy material, and then collected the chyle during digestion they would find many colonies of bacteria in plates made from this material. On the other hand, when they gave the dogs a plain bouillon without grease no bacteria whatever would be detected in the chyle. During the past winter at the laboratory of the State Live Stock Sanitary Board we have carried out similar experiments. We would keep a dog under observation some days to determine that it was entirely healthy. Then a purge of castor oil was given to clear out the intes-

tine, after which the animal was fasted for twenty-four hours. At the end of this time a single meal consisting of equal parts of butter and warm water made into an emulsion, to which tubercle bacilli in large numbers were added was given. At the end of three to four hours, during active digestion the dog was chloroformed, and as much chyle as possible collected, together with mesenteric glands. The intestine of the dog was examined throughout, and in two animals microscopic sections were made from a number of portions of the intestine. In all cases they were found to be entirely normal.

In ten animals experimented on we found tubercle bacilli in eight, showing that the tubercle bacillus can pass through the perfectly healthy intestine without leaving any trace, and that this takes place in a very short space of time. When we remember that the chyle goes directly into the thoracic duct, and is thrown into the circulation near the heart, from which it passes to the lungs immediately, we can understand that infection through the intestine may readily show itself first in the lung. I have here a photograph of the organs of a guinea pig, inoculated with the material from one of these dogs, which I think, justifies me in saying that tubercle bacilli pass through the intestine in large numbers. The extent of involvement in this guinea pig shows, I believe, that the material with which it was inoculated contained many tubercle bacilli. When an observer tells me that he has found no evidence of primary intestinal tuberculosis I ask him to explain the large number of cases of mesenteric involvement, and of peritoneal infection, which must have taken place by the passage of tubercle bacilli through the intestine, although the intestine itself may show no sign of injury.

Prof. McFadyean of the Jenner Institute has recently published a paper bearing on this point and bringing out a fact of great interest. In a comparative series of experiments he fed some monkeys bovine and some human tuberculous material. Those infected with bovine material showed no intestinal involvement whatever, but general infection of the lungs and abdominal organs, whereas those fed with human material showed intestinal involvement together with infection of the other organs of the body. This point needs to be investigated further, but so far as it goes it indicates that the bovine tubercle bacillus passes the intestinal wall without producing lesions, whereas the human tubercle bacillus in passing leaves a mark of its effect. In the experiments done by myself the bovine tubercle bacillus was used in the eight successful cases.

Perhaps the strongest evidence that we have of the infection of human beings by the bovine tubercle bacillus, is the finding of bovine tubercle bacilli in the intestines of children who have died of intestinal

tuberculosis. The first of these cases reported was from the laboratory of the State Live Stock Sanitary Board, the material having been sent by Dr. Alfred Hand of the Children's Hospital in Philadelphia. His pathological report stated that it was the clearest case of intestinal tuberculosis that he had ever seen. The organism was isolated in pure culture and was found to correspond in every way with the bovine tubercle bacillus. It proved fatal to calves in less than a month, and a six year old cow succumbed in eighteen days. This organism was sent to Dr. Theobald Smith who examined it by his recently described method of cultural differentiation. He pronounced it to be the bovine organism.

Dr. Smith has during the past year added his name to the list of those who have found the bovine tubercle bacilli in the intestine of children. Dr. de Schweinitz, of the Bureau of Animal Industry, has found two cases in which the infection was evidently of bovine origin, as judged by the virulence of the bacillus isolated for cattle, the test proposed by Koch. In Europe, Febiger and Jensen have reported three cases, and the Commission of the Imperial Sanitary Office of Germany, as before stated, has found four cases out of sixteen examined. We may pause here for a moment to consider the report of this Commission, which is remarkable. Cultures were obtained from thirty-nine sources, twenty-three of which were adults, and sixteen children. There were 19 cases of pulmonary phthisis, 4 cases of bone tuberculosis, 2 cases of cervical adenitis, one case of genito-urinary tuberculosis, 6 cases of miliary tuberculosis, and 7 cases of the digestive tract. Of the 39 cultures examined, 19 produced no lesion in cattle, 9 caused a slight enlargement of the glands of the shoulder, without tendency to generalization; 7 a somewhat more marked involvement of this gland, while 4, all obtained from children, caused a generalized infection. Two of these four cases are described as "miliary tuberculosis," beginning from a bronchial adenopathy, and a mesenteric adenopathy respectively, while the remaining two were cases of intestinal tuberculosis. The cultures from the last two showed a very intense virulence for calves.

The Commission points out that two of these four children did not die of tuberculosis, hence they conclude that in only two out of thirty-nine cases are they able to say that infection with the bovine tubercle bacillus has caused fatal tuberculosis in man. It is difficult to see the force of such reasoning.

Thus from the camp of the enemy, if I may use such a word for a scientific discussion, where our point is only to know the truth, we obtain the strongest evidence that bovine tuberculosis is transmissible

to man. Considering all of these cases we must either admit that they were cases of bovine infection of children, or we must say that the human and bovine bacillus are one and the same. From the hygienic standpoint it makes very little difference which view we take.

Professor Orth, in answer to the report of the Commission places a different interpretation on these results, and one which appears to us more rational. He holds that the seven animals which showed marked involvement of the lymph glands of the shoulder should be considered as infected with human tuberculosis. That the infection was not more grave proved only that in cattle, as in man, tuberculosis may undergo spontaneous cure. Of the thirty-nine cultures studied, he considers that eleven or 28%, were virulent enough to infect cattle.

There remains but one more consideration, and that is the information to be obtained from the study of the tubercle bacilli derived from different sources. Credit belongs to an American, Dr. Theobald Smith, for having demonstrated the difference in cultures obtained from human and bovine sources.

The human tubercle bacillus is much easier to obtain in pure cultures than the bovine. The first generation will often show luxuriant growth and generally sub-cultures can be obtained on glycerine agar from the first generation. The bovine tubercle bacillus on the other hand, grows very slowly in the first generations, forming an extremely thin layer on the surface of the medium, often resembling ground glass. Some cultures require six to eight months before enough growth can be obtained with which to inoculate animals. A growth on glycerine agar will usually take place only after the organism has been cultivated for several generations on blood serum. Some cultures which I have obtained have required a year to obtain a growth on glycerine agar.

The staining characteristics are somewhat different. The human bacillus is long, slender and shows beading, whereas the bovine bacillus is thick, shorter and stains evenly. I do not feel however, that a positive diagnosis can be made of the two organisms by the characteristics just given. The chief difference between them is in their virulence. The bovine tubercle bacillus has a pathogenic power tremendously in excess of that shown by the human bacillus. For all experimental animals which have been tried, the bovine tubercle bacillus shows this excess of virulence, with the exception perhaps of guinea-pigs and swine. These two animals are so susceptible to both types of the bacillus that it is hard to draw a distinction. The animals experimented on include horses, donkeys, sheep, goats, dogs, cats, rabbits, guinea pigs and monkeys. There is absolutely no case in all literature so far, that I am aware of, in which one single species of animal is

more susceptible to the human tubercle bacillus than to the bovine. This greater virulence of the bovine bacillus is shown by whatever method of inoculation we use.

As said by Villemin, "man shares with cattle the sad privilege of perpetuating tuberculosis." Would it not then be an anomaly for man, who is acknowledged to be one of the most susceptible of all animals, to be an exception to this general rule of increased virulence of the bovine bacillus? If all other animals, excepting those which are equally susceptible to both, succumb more quickly to the bovine bacillus than to the human, would it not be strange for man, one of the most susceptible of all animals, to show an immunity to the most virulent form of tuberculous virus known? Our nearest relative, the monkey, shows also this greater susceptibility to bovine infection, as proved by de Schweinitz, de Jong, at the laboratory of the State Live Stock Sanitary Board, and by others. Therefore I think we are safe in concluding that this increased virulence must hold good for man also.

In conclusion I would once more call your attention to one point, which to me seems conclusive, namely, the finding in the intestine of children the bovine tubercle bacillus. If we compare the percentage of cases in which this bovine organism has been found, we see that it corresponds very closely to the figures given in England of primary intestinal tuberculosis. It must be admitted that enough cases have not been brought forward so far to justify us in speaking with certainty on this point, but so far as they go the relation between the two is very striking. With the late Professor Nocard, I hold that bovine tuberculosis is transmissible to man, and that every precaution should be urged by us as sanitarians for the protection of food supply derived from cattle.

REPORT OF THE COMMITTEE ON THE ETIOLOGY OF YELLOW FEVER.

By Dr. JOHN W. ROSS, U. S. N., Chairman, Washington, D. C.

Among the contributions to the study of the etiology of yellow fever which have appeared since the last annual meeting of the Association we would invite attention to the following:

I. An article by Dr. Carlos J. Finlay in the *Revista de Medicina Tropical,* of April, 1903,—"Probable Nature and Life Cycle of the Yellow Fever Germ." In this he infers from the analogy of the conveyance of this disease with that of malaria —

(a) That the germ in question is a protozoön;

(b) That its phases of development are more or less similar to those of the malaria parasite;

(c) That as the infection by the yellow fever parasite of *Stegomyia* was indefinite in duration, while that of man was for a very short while, and the infection of man by the malarial parasite was indefinite in duration, and that of *Anopheles,* probably, was short; the inference is that the role of these hosts is *interchanged* for these two parasites and that the yellow fever parasite has its sexual reproduction in *man* and its schizogonic reproduction in the *mosquito*: that man is its definitive and the mosquito its intermediary host;

(d) That it is ultra microscopic.

The third conclusion is sufficiently original and has an obvious and direct bearing on the search for the micro-organism of yellow fever and to unravel its life history.

II. The report of the "Working Party"— Parker, Beyer and Pothier — at Vera Cruz, in Yellow Fever Bulletin No. 13, of March, 1903; U. S. P. H. and M. H. S. Their findings (which are evidently regarded as yet tentative, and with which must be taken a paper by Parker in the Journal of the Association of Military Surgeons, of October, on the "Etiology of Yellow Fever") are:

(a) That no specific organism was found in human blood during life or in any tissue after death;

(b) That the ovaries of *Stegomyiae,* after feeding on a yellow fever patient, first hypertrophy, as after a meal of normal blood, and then undergo complete atrophy;

(c) That the salivary glands of infected *Stegomyiae* undergo excessive hypertrophy;

(d) That in such mosquitoes a parasite was found—"a small fusiform protozoön"—in the stomach three or four days after feeding. This parasite passes out of the stomach into the oesophageal diverticulum and there, in an albuminous mass derived from the last blood meal, undergoes a development analogous to that of the coccidia, and passes out into the connective tissues around the cells of the salivary glands, and, presumably, into the ducts of these glands, whence they would be naturally discharged by the insect feeding.

The report is of great interest and further work along this line is exceedingly desirable; to determine:

(a) If the changes from the normal in infected mosquitoes, reported by these observers, is constant;

(b) The *certain* explanation of the appearances, interpreted as phases of the development of a coccidium;

(c) If this be agreed, the role that coccidium plays in the etiology of yellow fever; and

(d) If possible, to complete the life history of the micro-organism in man.

The findings of this report are absolutely at variance with the views of Finlay given above, as they make the sporogenetic cycle occur in the mosquito.

III. A paper on the distribution of *Stegomyia,* by Theobald, in *Tropical Medicine,* for August, 1903.

This is concerned mainly with the Old World and gives this genus a wide-spread, well-nigh universal distribution in the low-lying lands of the Eastern Hemisphere within 43° on each side of the Equator. That of the species *Stegomyia fasciata* is as wide and almost as general. While only *Stegomyia fasciata* has been proven to convey yellow fever, yet from analogy we should expect that other species of *Stegomyia* (of which Theobald names 25) would do so. Theobald characterizes *Stegomyia fasciata* as: "Almost exclusively a tub and pot breeder."

He found that adults lived two months, never having been fed, from the larval state and then died for want of water.

IV. In the same number of the *Revista de Medicina Tropical* as Finlay's article, Guiteras observed eleven *Stegomyiae* which had fed on a yellow fever patient. Of these seven lived over 64 days and one to 154 days. He, also, as an experiment in hybernation, placed 33 female *Stegomyiae* in an ice chest, kept at from 8° to 10° C., without food or water; three survived to the 87th day when they were destroyed by ants.

There are to be presented at this meeting of the American Public Health Association, the following papers:

A. SOME CHARACTERISTICS OF STEGOMYIA FASCIATA WHICH AFFECT ITS CONVEYANCE OF YELLOW FEVER; by Surgeon H. R. Carter, U. S. Public Health and Marine Hospital Service.

B. CONCERNING THE GEOGRAPHIC DISTRIBUTION OF THE YELLOW FEVER MOSQUITO; by L. O. Howard, Ph. D., Chief Entomologist, U. S. Department of Agriculture; Hon. Curator of Insects, U. S. National Museum; Consulting Entomologist, U. S. Public Health and Marine Hospital Service.

C. PERIOD OF THE DISEASE IN MAN DURING WHICH YELLOW FEVER CAN BE TRANSMITTED TO THE MOSQUITO; by Colonel W. C. Gorgas, Assistant Surgeon-General, U. S. Army.

MINOR PROBLEMS IN THE ETIOLOGY OF YELLOW FEVER YET TO BE INVESTIGATED.

Although the paramount problem of the etiology of yellow fever, viz: Its conveyance to man solely by the genus *Stegomyia*, is already solved, the committee believes that a statement of some of the minor problems yet remaining for solution may be of service to investigators.

We exclude the identification and life history of the long-sought-for but still undetermined specific micro-organism of yellow fever. That is a *major* problem little less important, scientifically, than the discovery of its conveyance by the mosquito host.

1. The determination of the period of the disease in man during which yellow fever can be transmitted to the mosquito. So far experiments have shown that it is transmitted somewhat over two days, i. e., in the first, second and third days; but there are no sufficient experiments to prove that the third day is the limit at which the mosquito can be infected. The importance of this determination is obvious.

2. The determination of the minimum period after feeding at which a mosquito can become infective.

Reed has shown that this seems to depend on the temperature — being greater in low temperatures. The minimum period in his experiments was twelve days, in his first experimental case, and, judging from observation on yellow fever as it occurs in nature, this is probably near the limit. Still no sufficient attempt has been made to show that mosquitoes contaminated less than twelve days cannot convey yellow fever in the summer.

Since the determination of this point, experimentally, would involve producing yellow fever in probably a considerable number of human beings, and since the minimum in Reed's experiments agrees closely with previous observations on yellow fever, the committee does not think that experiments for this purpose are justifiable.

3. To determine if other mosquitoes than *Stegomyia* convey yellow fever, and if other species of *Stegomyia* besides *Stegomyia fasciata* can do so. The first is, from analogy, very improbable; the latter, for the same reason, is probable.

4. To determine if *Stegomyia fasciata* is found breeding at a distance from human habitations, i. e., if it is anywhere a true sylvan, campestral or palustral mosquito.

5. A closer study of the hibernation of this insect is desirable (especially the hibernation of infected females), to determine:

(a) What proportion of the infected females survive an ordinary winter in the Gulf States;

(b) Whether such as survive retain their power of transmitting yellow fever.

6. To determine if *Stegomyia faciata* is capable of acclimitization in environments unfavorable to the immigrant mosquitoes also deserves observation and experimentation.

7. To determine the distance across water that this insect is aerially conveyed. If desired it will be easy to differentiate the blood-fed (not necessarily infected mosquitoes) by observing if they deposit eggs. If the finding of the Vera Cruz "Working Party" be correct, the infected mosquito deposits no eggs after a short time after becoming infected.

8. Finally, it seems advisable to determine directly by observation whether this mosquito is carried by railroad trains, and if so, in what number, and generally the conditions of such transfer. On this may depend measures of land quarantine.

REFLECTIONS ON THE DESIRABILITY OF AN AGREEMENT BETWEEN THE SANITARY AUTHORITIES OF ADJOINING COUNTRIES FOR MUTUAL DEFENSE AGAINST TRANSMISSIBLE DISEASE.

By Dr. EDUARDO LICEAGA,
President of the Supreme Board of Health of Mexico, Mexico, D. F.

One of the subjects of special interest that occupies the attention of the American Public Health Association, is that of preventing the propagation and development of transmissible diseases. The interest in this subject is increased, when it becomes a question of preventing the transmission of such diseases from one nation to another. The Association has appointed committees of its members to study the question from the two points of view that I have just mentioned; but there is another from which I want it to be considered at the present moment and which I propose to formulate as follows:

The measures which are intended to avoid the transmission of an epidemic disease from one country to another, should be such that whilst they protect the health and interests of the nation which defends itself, they will not injure, or only as little as possible, the interests of the other nations, from which the danger is feared.

We have so understood it in Mexico, and by way of example, I will present a concrete case in the Mexican Republic, and its relations to this powerful nation, which now so hospitably receives us in the capital city of its enormous territory.

In the month of December, last year, and whilst I was attending the meeting of this Association, I learned from the distinguished physician who here presides that in a small port of my own country, Ensenada de Todos Santos, in the southern part of Lower California, it was suspected that bubonic plague had appeared. I at once cabled to my Government to take the necessary steps to ascertain the truth of this report, and enforce such measures as might be thought desirable under the circumstances. As there was no telegraphic communication between New Orleans, where the meeting was being held, and the port of Ensenada, for the purpose of deciding the first problem and ascertaining whether the bubonic plague really existed in the port above mentioned, with the authority of my Government I accepted the offer made to me by Dr. Wyman, to send Dr. Grubbs, an officer of the Marine-Hospital Service, to study and investigate on the spot.

This officer in fact discovered the existence of a focus of bubonic plague in the port of Ensenada, but it disappeared completely, and from the 25th of December up to the present date no other case has appeared.

The facts which I have above mentioned demonstrate the desirability of the sanitary authorities of the two countries coming to an agreement in order to fight against an evil that threatens the two. There can be no doubt that the assistance which the United States gave to Mexico on this occasion greatly contributed to the rapid disappearance of the danger that threatened the two countries.

The arguments that follow are copied from a communication which I have addressed to Dr. Walter Wyman of the Public Health and Marine-Hospital Service of the United States, and are as follows:

"After my return to Mexico and as soon as I heard that a disease had appeared in Mazatlán, which was suspected of being bubonic plague, I communicated the fact to the International Committee of the American Republics. When, on the 31st of December the microscopic and bacteriological examination demonstrated that the cases of epidemic diseases which had been observed in Mazatlán were in fact bubonic plague, I reported it to you in the same capacity. During the entire course of the epidemic I have done my best to keep that committee informed of what was going on in Mazatlán and surrounding villages. When three commissioners were successively sent to Mexico by the Marine Hospital Service, I supplied them with all the data which they required to enable them to report to their superiors on the actual condition of the plague.

I have had an extra bulletin of the Supreme Board of Health published, in which a history was given in the Spanish, French and English languages, of all the steps which were taken by the federal government as well as the governments of Sinaloa and the adjoining states, in order to stamp out the bubonic plague. When this disappeared from Mazatlán, I also reported the matter to you. When a new case appeared in a country house on the Cerro del Vigia, near Maztlán, I also communicated the fact to you. When, a long time after the disappearance of the epidemic in the villages round Mazatlán a small focus of the disease presented itself in the village called "El Vajío," I promptly sent you information of the fact.

Ever since the yellow fever passed beyond its ordinary boundaries in the port of Veracruz, in Méridia and Progreso, where it has been enidemic, I have given orders for a weekly bulletin to be forwarded to the International Committee of the American Republics, showing the cases observed and the deaths that were registered in the different places that were invaded by the epidemic.

All this goes to prove that the sanitary authorities of Mexico have strictly complied with the resolutions of the sanitary convention which met in Washington in December of last year.

In accordance with these resolutions, it was the duty of the International committee to notify the sanitary authorities of the cases of plague or yellow fever that might be observed in the other re-

publics which took part in that convention, but up to the present I have received no such notice. To-day, for the first time, Dr. Tabor, of the state of Texas, has sent me the sanitary bulletin of Laredo, Texas, for the 16th inst.

In compliance with the resolutions of the convention, I have protested against the quarantine imposed by those authorities because it is not in accordance with the doctrine of the transmission of yellow fever by means of the *Stegomyia* mosquito which was accepted by the convention, and also because the second resolution says that the period of detention and disinfection in the quarantine stations must be as short as is compatible with the public security and in accordance with the teaching of science.

The sanitary authorities of Texas have answered the agents in Laredo and C. Porfirio Díaz, that the convention of Washington had nothing to do with the quarantine.

In view of these circumstances, I desire to submit for your personal consideration, in your capacity of chief officer of public health in the United States, president of the international committee of the American Republics, and present president of the American Public Health Association, the following reflections:

The etiology of many diseases is now perfectly well defined, and therefore the measures which are adopted by nations to mutually defend themselves against such diseases are perfectly well defined. In former times every nation took restrictive measures to defend its national interests without taking into account the injuries which it might work against those nations from which the transmissable diseases proceeded. The time has now arrived to proceed in another manner. Because men belong to different nationalities they are not any the less members of the human family, and it is from this point of view that we have to consider the question. It is unnatural for civilized nations to treat each other as enemies, but on the contrary, animated by the sentiment of fraternity, they should consider other men as their brothers and live up to the precept, to "Do unto others as ye would have them do to you."

For the above reasons, I now beg to propose to yourself and to the American Public Health Association, that a committee should be appointed to fix the rules which will govern the conduct of the sanitary authorities of the different countries, on the basis, that in attempting to defend a country, province or state, they should not only take into account the rights of the ones they desire to defend, but also those of the ones against whom they prepare their defence.

The states that are in the vanguard of the present civilization have had to undergo the evolution that is necessary in all human acts; they commenced with weak efforts, fruitless endeavors and imperfect struggles before they were able to establish precise and practical rules that would be in accordance with the general interests. In my opinion it is necessary for the most advanced nations to think of those that are less advanced and that find themselves in a similar situation to the one they were in themselves when they commenced their labors.

The Mexican Republic is making powerful efforts to overtake the most civilized nations, and this in a much shorter space of time than that which has been employed by any other nation in its regenera-

tion. As an example of this, we cite the success with which we finally stamped out the bubonic plague, which appeared within the territory of the republic at the end of last year. A similar example can be found in the efforts we are now making to reach a higher degree of civilization, and not claim that perfection should be obtained at any given moment. The authorities of Texas have been teaching us in this manner, and my present desire is to obtain, through the intervention of the American Public Health Association, an agreement with the sanitary authorities of the United States, and of the state of Texas in particular, under which the reciprocal measures of defence for the American territory as well as for the Mexican Republic, shall be carried out by agreement between the sanitary authorities of the two countries, and not independently as regards matters that affect the interests of both countries.

COMMENTS ON THE REPORT OF THE COMMITTEE OF THE ASSOCIATION ON THE ETIOLOGY OF YELLOW FEVER.

By Dr. JUAN GUITERAS,
Director of Las Animas Hospital, Havana, Cuba.

Of the nine cases of yellow fever at Las Animas Hospital, tabulated in the report of the committee, three died. To these we should add the body of a man who died from yellow fever as the ship was entering the harbor, and which was brought to Las Animas Hospital. These four bodies were laid out in the dead-house of the hospital, and were handled by a non-immune attendant, who assisted at the four autopsies, handling the viscera. This same man goes into the wards daily and obtains the blood from all patients, including those attacked with yellow fever, for hematologic studies. The urine, the feces, and the black vomit from said patients are examined in the laboratory without any attempt at disinfection. The attendant, a faithful *diener*, who would not, however, allow himself to be bitten by an infected mosquito, works all day in the laboratory. Furthermore, scarcely a week goes by, summer or winter, without a visit to the wards and laboratory of Las Animas Hospital from Northern friends, and other non-immunes, who are interested in the work. The daughter of the President of the Republic, and my own daughter, who lives on the grounds, both of them non-immunes, are frequent visitors.

The occurrence of exposure to undisinfected fomites is so frequent, it has become such a matter of course, so natural and uneventful, that no notice is now taken of the daily demonstrations.

How often have I wished, of late, that our friends of Texas, who have stampeded, carrying yellow fever over a State, utterly unprepared to meet the conditions, could witness the peaceful rounds of yellow fever life within a mosquito-barred house. I mean to say by this, and I wish to speak plainly, that the conditions now existing in Texas are solely due to the unpreparedness of those communities.

At the Conference of State and Provincial Boards of Health, held at New Haven last year, I begged the leaders of medical opinion in the Southern States to start a campaign of education on the principles of the mosquito doctrine; to send officers to Havana to learn practically the specific methods of defense against this disease, and to establish and maintain in active operation the mosquito brigades in the exposed places. Instead of doing this, the attempt was made to

keep up the delusion of fomites infection, and, in the beginning of the present epidemic, it has not been possible to keep public opinion from demanding the disinfection of the mails. It is satisfactory to note that when the proper discipline has become at last established, the happy results that were to be expected are being obtained in southern Texas.

Let us fix our attention upon the fundamental difference between the work doing in Texas and the work doing in Havana. In Texas there was the usual wrangle over the nature of the first cases. To handle them as cases of yellow fever would create a panic. The result is that the measures of prevention were not commenced until there was really some ground for a panic. In Havana we act otherwise. Every case in which there appears to be the remotest possibility of yellow fever is treated as if it were a case of the disease. It is enough that our commission for infectious diseases be called upon to visit a case concerning which suspicions may have been advanced by anyone; the mosquitoes are destroyed in that house, although the commission may pronounce a very positive opinion that it is not yellow fever. Our specific treatment does no harm; it simply keeps our mosquito disinfecting brigade in practice. There are two cases of yellow fever in the tabulated list presented by the committee that deserve special mention.

John Fay was admitted June 30 and discharged, cured July 14th. He was a passenger in transit to New York on the steamship Matanzas. The case was detected at the time of inspection by our quarantine officer. Now, our health department could have shirked all responsibility in connection with this case and allowed it to proceed on its way north. The captain and the patient himself were opposed to our interfering in the matter. Yet we decided upon the removal of the patient, with a view to preventing further infection of the ship. The health department of Havana, therefore, almost forcibly removed a case of yellow fever from a ship in transit, and brought him into the city and to Las Animas Hospital. This shows the thorough confidence we have in our methods to prevent the spread of yellow fever.

The other case is that of V. Baron, admitted July 11th, died July 14th. This man had a false certificate of immunity, and was therefore allowed to land without careful inspection. He was in the second day of the disease, on the day of landing, July 9th. He did not send for a physician, but went to the city hospital on the morning of July 11th. There he was recognized at once as a case of yellow fever, and was sent to Las Animas Hospital. This man, therefore, remained in the city of Havana, exposed to mosquito bites during the second and third days of the disease. His place of residence was in the

heart of the business portion, Inquisidor St., No. 28. He remained for a short while in my ward (mosquito-screened) of the Mercedes Hospital, whose protection against mosquito bites was far from being as certain as it is in Las Animas Hospital. Now, mark the advantage we have over this disease. The mosquitos that had bitten this man could do no harm immediately. We had, when the patient was discovered, ten days at least, before us in which to destroy all the insects that had bitten the patient. You can well imagine how eagerly we took advantage of this opportunity. Mosquitoes were destroyed in the infected house, in the whole block, and in the hospital Mercedes. Though all this happened in the month of July, and in the city of Havana; though there were two non-immunes in the ward at Mercedes, eight in the house in Inquisidor St., and a much larger number in the block, not one of them became infected.

SOME CHARACTERISTICS OF THE STEGOMYIA FASCIATA WHICH AFFECT ITS CONVEYANCE OF YELLOW FEVER.

By Dr. HENRY R. CARTER,
U. S. Public Health and Marine Hospital Service, Baltimore, Md.

It is not proposed here to go into the life history of *Stegomyia fasciata,* but simply to call attention to such of its peculiar characteristics, differentiated from mosquitoes in general, which seem especially to influence its role as a conveyer of yellow fever.

Here let me premise that only this species of the genus *Stegomyia* has been shown to act as a host for the conveyance of yellow fever to man. Following the analogy of malaria and *Anopheles* we would expect that the other species of *Stegomyia* (of which there are many), or at least some general subdivision of the genus most closely allied to this species, would act in like manner. No attempt to determine this point has been reported. *Stegomyiæ,* other than *Stegomyia fasciata,* must then with our present knowledge, be regarded with suspicion as *probable* hosts for yellow fever, but against which the charge is not proven. Similarly analogy is against any other genus of mosquitoes being able to act as host for the micro-organism of yellow fever.

BOSTON MED. LIB. AUG 23 1905

Of the characteristics of *Stegomyia fasciata* which affect its role as a conveyer of yellow fever the first that we will consider is

(1) Its Distribution.

Obviously this is all important. Localities in which this mosquito breeds and feeds on man are "infectable localities" and in them yellow fever is a communicable disease and will spread if cases be introduced without prceautions. Here we must note that this form has been of special interest only a short time and that the account of its distribution is necessarily lacking in completeness, and the fact that it has not been reported from a particular district, unless we know that careful and well planned search has been made, is not conclusive that it does not occur there.

All writers agree that it is widely distributed in tropical and subtropical countries. Theobald, in a recent monograph in Tropical Medicine, states that it is found generally between 43 North and 43 South. In North America, at least, we shall find its original habitat is much more limited and that even where introduced it does not make good its permanent settlement beyond North Lat. 38 or 38½. The writer above quoted gives its Old World distribution as follows:

Asia: India generally, Coast and Interior. Malay States, Farther India, Celebes, New Guinea, Japan, Palestine.

Australia: Queensland, New South Wales, Victoria and South Australia very abundant.

Africa: West coast from Senegambia to Nigeria. East coast from Port Said to Durbin. At Pretoria and British Central Africa generally; and Uganda, (As it has been found at the Savannah Quarantine Station oboard a vessel direct from Cape Town, this district also must harbor it.)

Europe: Spain, Portugal, Italy and the Mediterranean Islands to Cypress. Especially abundant at Gibraltar.

Oceanic Islands: Fiji, Mauritius, Seychelles.

They are also found in Hawaii, having been introduced within the last generation.

It had not been reported in the Philippines, a matter of interest to us, nor on the Chinese coast, although other forms of *Stegomyia* are found in both places, and with the communication between these places and Japan; India and the Straits settlements it seems improbable that this form has not been introduced, and probably they do exist in both countries, at least in the coast cities.

Obviously the wide distribution here noted in countries hitherto free from yellow fever, makes it extremely important not to introduce men sick with yellow fever into them. If other forms of *Stegomyia* besides *"fasciata"* can also convey yellow fever the territory to be guarded becomes considerably increased.

In America this form has been reported from a number of the West India Islands and east coast towns of Mexico, Central America and South America as far south as Montevideo. They have been so generally reported where they have been looked for in these limits that they may be regarded as generally present in the coast towns from the Rio Grande to the La Plata.

They are also found at Panama and at Guyaquil on the west coast. But few reports, and I think but few examinations, have been made of the interior towns. They have been found in some of the interior towns of Cuba and in Orizaba and Linares, Mexico, and in Merida. At some interior towns they have been reported absent after search, as at Jalapa and Guatemala.

To determine its distribution in the United States correspondence was entered into with gentlemen in nearly every town on the Atlantic, Gulf, and Pacific Coasts; as well as in nearly all towns of any size on the Great Lakes and on the Mississippi and Ohio rivers, and a considerable number of towns inland. In quite a number of instances, especially outside of the so-called yellow fever district, no sufficient

search known to my correspondents had been made for this insect; but in the majority it was possible to obtain a satisfactory answer, negative or positive; and from quite a number specimens of *Stegomyia fasciata* were received.

To enumerate all the places at which it was found in the United States would take too long. Generally it was reported as found in all of the coast towns from Norfolk, Va., to Galveston, in which a sufficient search has been reported as made. It was also found at a number of interior towns; Houston, Texas; Shreveport, Franklin, and other towns in southwest Louisiana, in Biloxi and Pass Christian and in some other places, in the interior of Mississippi, in several towns — at all of which search was made — on the Mississippi River, up to, and including Cairo, Ill.; also some interior towns in eastern Georgia. It is the less necessary to give the details of this distribution as I had intended doing as I find Dr. Howard of the Department of Agriculture has also been engaged, with infinitely better facilities and success in collecting data on the distribution of *Stegomyia fasciata*, and as soon as his report is published we will have complete data on the subject. He writes me; "The list of localities from which I have received it is a long one. In general, I may state that, in my opinion, this insect will be found practically in all portions of the lower austral life zone in the United States. This includes all of the Gulf States, as well as portions of New Mexico and Arizona; it also includes the low-lying portions of South Carolina and North Carolina, and the southeastern portion of Virginia; it includes also southern Arkansas and southern Indian Territory, as well as western Tennessee and western Kentucky, the extreme southeastern corner of Missouri and the extreme southern tip of Illinois." Obviously my determination is included in his more complete one.

Within this district they have been reported absent; that is, not found after sufficient search: At the Quarantine Stations at Ship Island, Mullet Key, Blackbeard Island, at the Savannah Quarantine Station, at the Cape Fear Station, and at the adjacent town of South Port, N. C.; nor have they been found on St. Catherine's Island, Ga. They have been found aboard incoming vessels at all save one of these stations, but none have been found ashore. We may note that Ship Island has been notoriously "non-infectable territory"; at the others I know of fewer exposures. All of these stations are wind-swept, isolated places; with abundant marsh, fresh and brackish, in the vicinity; with artesian water at the first and last, and cisterns carefully screened at Mullet Key. I do not know the water supply at the Savannah Station. They were found at the Brunswick Station but have disappeared under kerosening. Here cisterns were used.

The answers received from north of the Ohio and Potomac were decidedly less satisfactory than from points south. The *Stegomyia* having apparently excited little interest in the former, and hence not having been as carefully sought for. They are reported as absent, after careful search at Evansville, Cincinnati, Baltimore (except a few larvae which developed into *Stegomyia* found at the fruit wharf in early September), Lewes, Delaware and the Quarantine Stations of Delaware Breakwater and Reedy Island. They were not found on Staten Island or Governor's Island; or at the New York Quarantine Station, or at Buffalo, or at Sault Ste Marie. The writer especially regrets that he cannot say definitely whether they are found in Washington or Louisville, places which are on the border of their apparent range. He is sure that they are at least rare in both places, competent observers, although not especially on the search for this form, not having seen them. Indeed considerable search has failed to show them at Louisville.

On the west coast of the United States they are reported absent at San Diego and at Angel Island in San Francisco harbor, and are not reported as *present* at any port.

In spite of those found about the fruit wharf in Baltimore, it seems that practically they do not occur north of Cape Henry, and that they are found at all of the cities south of Cape Henry at which satisfactory search was made. Thus the old line of division for maritime quarantine: a line founded empirically on the spread, in recent years, of yellow fever when introduced, "The southern boundary of Maryland" was a fairly correct division of infectable and non-infectable territory. Indeed the old rules of maritime quarantine for southern ports are, except the disinfection of baggage, very generally applicable under the theory of its conveyance by this mosquito.

In America this form has so far been reported as found only about the habitations of men (at least the writer has been able to find none elsewhere reported). This was to have been anticipated because (1) the conditions which prevail about houses are especially suitable for its propagation. (2.) Being easily found about houses in districts where it exists it may not have been looked for elsewhere. Yet it is a matter of importance to determine if it breeds in woods, fields, or swamps distant from human habitations. In the United States the *indirect* evidence of yellow fever not spreading where introduced into new camps in the woods and fields — and cypress swamps as well — is against the natural occurrence of this form in such places in the United States.

If this be true of the tropics as well, Manson's proposition, to deforest and drain a belt one-half mile wide on either side of the Isthmian

Canal to prevent *Stegomyia* boarding vesels in transit, is unnecessary. It would be wiser to depopulate it.

Next we consider (2) Its Conveyance from Place to Place.

Obviously if they are conveyed from one place to another, this second place becomes infectable, temporarily in proportion to the number received; and, if the *Stegomyia* breeds and thrives in its new home, a settlement, more or less permanent, is established; and places which hitherto have received yellow fever patients with impunity can do so no longer but become, as long as the *Stegomyia* prevails, "infectable."

This change of infectability, not predicating the cause, is fairly common in the history of towns in the interior of the Gulf and South Atlantic States and not uncommon even in that of coast towns. Thus prior to 1855, Norfolk, Virginia had had yellow fever introduced a number of times, "almost every year," and occasionally there would be secondary cases — around the wharves — there was then a large coffee trade. In 1855 there was a severe and general epidemic. Fernandina was the place of refuge in '76 from the epidemics in Savannah and Brunswick and there was no spread of fever. In '77, following the advent of a vessel from Havana, a general epidemic arose; and again an epidemic in '88. Jessup, Georgia, gives a similar history.

(a). By railroads.

The writer has been able to find no conveyance of this mosquito by railroad, nor save at Evansville, Ind., by P. A. Surgeon Brown, has he been able to have any sufficient search made for them aboard trains running from towns which harbor *Stegomyia*. As other mosquitoes, notoriously the culicids, are transported by trains, it is probable that the *Stegomyia* is also. I have then no direct evidence of this that they are thus transported; but the cases of yellow fever contracted at St. Louis and Louisville toward the close of the epidemic of '78 by *local* trainmen and residents near the stations of railroads from the south is indirect evidence, which to my mind is convincing. To what extent this occurs should evidently affect our measures of inland quarantine.

(b). Conveyance by vessel.

Conveyance by vessel has been frequently noted. It is fair to say that the *Stegomyia not* being found aboard a vessel is evidence of its absence, of value only in proportion to the process of search adopted and the care taken in making it; and it seems fair to believe that they are conveyed by vessels, in small number, far oftener than the reports we have would lead us to believe. A negative statement of the crew is of little moment. People used to the fiery bite and myriad numbers of the "salt water mosquito" (*C. Sollicitans?*) which infest the wharves of tropical ports, pay little attention to a moderate number of elusive *Stegomyiae*. Probably the best way to determine their presence is to

put out breeding cups or, which indeed is better, to look for such receptacles as may have served for this purpose aboard. Failing this there seems no better way than direct search. Corput of South Atlantic Quarantine Station says: "I personally search the cabin and forecastle; all corners, closets, hangings, and roofs of berths." "A favorite place is in the corner over the shelf where the water bottle and glasses are kept; also the carpenter's shop on account of the water under the grindstone." In cargo vessels where the cargo is a food for mosquitoes, such as bananas, sugar, etc., they would most probably be found in the hold. There would almost certainly be water enough for their drinking in the hold, if only from condensation on the sides of the vessel, if an iron vessel. It is of course in vain to look for a small number of mosquitoes in the hold of a vessel, except by breeding cans.

Although conveyance by vessel has been frequently noted, yet they have been found aboard but a small *proportion* of vessels examined. Souchon's inspectors, in '92 found *Stegomyia* on only two fruit vessels for New Orleans out of a considerable number examined; the mosquitoes of this variety constituting two and one-half per cent of the mosquitoes found, while in the houses at the port of departure there were forty per cent of captures. This disproportion is in accordance with what we shall learn of their habits.

They have been found at Ship Island Quarantine aboard three vessels sailing from Vera Cruz, a considerable number of vessels were examined negatively. At Tampa Bay Quarantine Station, aboard one vessel sailing from Buenos Ayres. They had bred aboard in the water tanks, as had those in one of the previous cases. At the Savannah Quarantine they were found aboard two vessels; from Cape Town (direct) and Havana respectively, both sailing vessels, and aboard both "water barrels were alive with wrigglers" which developed into *Stegomyiae.* At South Atlantic Quarantine aboard five vessels; three sail, two steam; from Rio, Buenos Ayres, Lorenzo Marquez and West Indian ports; at Brunswick Quarantine Station aboard three sailing vessels all from Havana. Larvae were abundant aboard these three, and aboard four of the five at South Atlantic. Nothing is said of larvae aboard the fifth, a steam ship. Goldberger, at Tampico, found them aboard three steamers, on arrival from Vera Cruz. None on a considerable number from New York.

The writer has found *Stegomyia* at Baltimore aboard two fruit steamers, from Jamacia and East Cuban ports and, as noted, has bred a few of them from larvae taken from near the fruit wharf, while nowhere else in Baltimore has he been able to find them.

The "Working Party" (Parker, Beyer and Pothier) from observations at Vera Cruz, believe the transfer by iron vessels is rare, while by sailing vessels it is far more common. They base their opinion upon the paucity of suitable breeding places on the iron (steam) vessels as compared with wooden (sailing) craft. "The iron ship on account of its concealed water tanks acts simply as a mechanical host to those that come aboard, while aboard wooden vessels on account of the loosely covered deck containers, under proper conditions, they propagate." While their observations are not sufficiently numerous to warrant the general deduction that iron (steam?) vessels rarely carry this mosquito, yet their estimate of the comparative frequency with which steam and sail vessels convey *numbers* of them is undoubtedly correct. It is in accordance with the few observations given above and also with the indirect evidence (as has been frequently pointed out by the writer) that yellow fever is contracted aboard sailing far more commonly than aboard steam vessels.

There can be no doubt then, but that these mosquitoes are carried from place to place by vessels, especially sailing vessels, for indefinite distances (Cape Town to Savannah) in tropical waters.

This is of interest on two accounts:

(A.) It is a means of conveying the infection of yellow fever to other countries: (a.) by mosquitoes coming board already infected, (b) by mosquitoes becoming infected after coming aboard by feeding on cases of yellow fever developed aboard, but contracted ashore. Of course if there be no *Stegomyia* aboard, the occurrence of yellow fever among her personnel will not "infect" the vessel. In the absence of the host yellow fever is not a communicable disease.

(B.) The conveyance of uninfected *Stegomyia* to a country hitherto free from them, where they will propagate is, also a thing to be deprecated as it renders the country in question "infectable" if cases of yellow fever be subsequently introduced. Conveyance to a place where they will not increase is of little or no importance.

There is evidence, and it is, I think, generally held, that this mosquito is not indigenous to the United States, but was thus introduced from the tropics, and has from this become a permanent inhabitant of the Southern Atlantic Coast and Coast Plain, and the Mississippi Valley north to Cairo, Ill. The writer also holds this as an opinion, but he does not consider it proven for the southern part of this area. It is however, unquestionably true that they were very recently thus introduced into Hawaii, these islands having been free from mosquitoes prior to the arrival of a ship from San Blas, in 1826. They are abundant and generally distributed in these islands now.

We have said that the introduction of the uninfected *Stegomyia* into an environment where it did not increase was of no moment. This is true, but there is another question. Is this mosquito able so to adapt itself to a somewhat unfavorable environment that it can become, so to speak, acclimated? Can it, after some generations, thrive and increase normally in environments in which at first it could do so poorly, or not at all? Can it by a series of generations in environments increasingly unfavorable — all being unfavorable in the same way — finally propagate and thrive in a place where the parent brood would have died without successors? This is certainly true of other forms of animal life, generally in proportion to height in the scale of life. It was, and I believe is still, held true for the "Texas tick," also the host of a pathogenic parasite, and certainly has some antecedent probability. The Vera Cruz Working Party believe this to be true, and give reasons for their belief; yet to the writer they seem probable rather than conclusive, and he can only say that further observation is needed to answer the question, and that to answer it merits further observation. It is also conceivable that conditions, climatic and otherwise, may suffice for the host to thrive and yet not be such as to suit its parasite and thus the temperature limits of yellow fever and the *Stegomyia* not be identical. This is alleged* of *Anopheles* and the *Plasmodium Malariae,* although I think, not generally accepted.

(3.) Method of propagation.

(a). All observers note that by preference this form elects to breed in clear water, not necessarily clean water (Reed added small amounts of fecal matter to his breeding jars) in artificial containers, cisterns, tubs, barrels, cans, etc. Theobald classes them as "almost exclusively a can and pot breeder."

The New Orleans "Mosquito Commission" of 1902, in the part of the city where the above class of receptacles were available found *Stegomyia* larvae in 60% of them and in only 10% of gutters. On the outskirts of the city where such receptacles were not available the same commission found them in nearly 80% of the gutters examined. Other observers, however, have found them far less frequently in gutters and pools even when there were no other breeding places. The "Working Party" in Vera Cruz found *Stegomyia* larvae seldom in gutters, almost invariably in water cans. Taylor, of Las Animas Hospital, Havana, after finding them commonly in artificial containers, notes that they "are also found in pools," as if it were rare, and this is the general testimony of my correspondents who have found them breeding in the United States.

* Note too the very slow development of the infecting power of the *Stegomyia* in Reed's December experiments in Havana.

Muddying and disturbing the water in the pool causes the death of many of the larvae. Possibly on this account the pools on the outskirts of New Orleans were more suitable for breeding than those in the more inhabited parts of the city, indeed a still, undisturbed pool of water, cleared by standing, should, for this purpose, differ in no wise from a hard walled receptacle. *Stegomyia* is not a cess-pool breeder.

(b). The time from egg to fly is from two to four days shorter than others of its general order, *Culicidal.*

(c.) Eggs are at times laid above water and, if kept dry, will preserve their vitality a long time. Finlay has kept eggs dry six weeks, Theobald (eggs sent by Finlay) over two and one-half months, and Reed ninety days, and then hatched them. The latter states that freezing does not destroy their fertility.

Its choice of breeding places indicates the especial danger of open cisterns; water jars and collections of water in any artificial container; cans, troughs, etc. Thus the measures for their destruction are in contrast with those against *Anopheles.* In Gorgas' work in Havana the *"Stegomyia Brigade"* waged especial war in town and on artificial receptacles about houses. The *"Anopheles Brigade"* drained and kerosened puddles and pools in the suburbs.

It is well to note that the larvae are not gotten rid of by emptying the water jars, as it is usually done in daily use. The "Working Party" in Vera Cruz found that when water was poured from a jar the larvae present sought the very bottom and, unless the jars were tipped up so as to empty them completely, which was not usually done, nearly all the larvae remained in the jar.

Obviously then the introduction of water by pipes into all houses, rendering the keeping of water in containers unnecessary, is a most important measure in freeing a town of this mosquito. Natural pools, however, must by no means be neglected and the necessity of drainage, and with drains underground in place of open gutters, is, especially from the observations in New Orleans, equally obvious.

The slightly shortened period in the egg and larval state and that the eggs are occasionally laid above water and may preserve their vitality almost indefinitely, plainly make for the preservation of the insect and this latter may be a means by which it survives the winter in (for it) north latitudes.

(4.) The habits of the adult, female.

In spite of some statements to the contrary, the evidence seems conclusively that only the female *Stegomyia* feeds on man, or if the male does so it is extremely rare.

(a.) The female is very long lived. Theobald has kept them alive two months from the larvae without food; these specimens finally dying for want of water. Of eleven mosquitoes, five days old, fed by Guiteras on a case of yellow fever and hence infected insects, only two had died on the 41st day, five lived over 101 days and one 154 days.

(b.) Having acquired the power of communicating yellow fever they preserve it apparently as long as they live. Reed reports yellow fever transmitted on the 59th day after feeding on a yellow fever patient.

The conveyance by vessels, shown before, together with the long life and persistence of this mosquito in transmitting yellow fever increases the difficulty of protecting the countries of the Old World, where the *Stegomyia fasciata* is found, from yellow fever. Because although so distant that it is not possible for a man contracting the disease in America to contaminate mosquitoes in, say Japan, yet it is perfectly possible for a mosquito contaminated in America to infect a man in Japan, and from him any number of *Stegomyiae.*

Hitherto there has been but little direct communication from the yellow fever ports on the west coast of America with the east (all the coast of America from Payta, south and from Cape St. Lucas north is free from infection); but this may not be the case when the interoceanic canal is open. Yellow fever introduced into a country like India or the Straits settlements might well become epidemic and, if so, such countries would in turn be a continual menace to the rest of the (infectable) world, repeating the history of Rio Janiero and, probably that of Havana.

(c.) They are essentially house mosquitoes. Not only do they breed best under the conditions which obtain in and about houses, but having entered a living house and fed, they do not like to leave the premises. Here again their habit is in contrast with that of the *Anopheles.* It was the almost universal existence of this mosquito in the houses of Havana which first led Finlay to select it as the probable conveyor of yellow fever, an essentially house disease. Indeed his early arguments based on the peculiarities of this insect and the observed phenomena of yellow fever, dove-tailing in with the theory of its conveyance of yellow fever to man is an extremely beautiful piece of deductive reasoning.

The limitation of infection to the neighborhood of houses which contain, or have contained yellow fever patients is a marked feature in the early part of an epidemic.

(d.) It requires a considerable interval of time, generally about fourteen days in summer, after feeding on one sick of yellow fever before the mosquito is capable of imparting the disease.

If then the mosquitoes be destroyed or all people be removed soon after the first case of yellow fever develops in a place, no one will have been exposed to infection and these people need not be regarded as "suspects." The minimum limit of this "extrinsic incubation" of yellow fever is not certainly fixed. Twelve days is the shortest which has been so far found in experimental cases.

(e.) Its time of feeding.

Observers seem to disagree as to its hours of feeding, but the disagreement is more apparent than real. All agree that its principal time of flight is in the afternoon. It is "essentially crepuscular." Reed says: "after four o'clock." The New Orleans Commission: "especially in the afternoon hours." The Vera Cruz Working Party states "early in the morning and late in the afternoon." It does not feed in the dark nor does it in a strong light, and its feeding seems more dependent on the degree of *light* than on the time of day. If the place be fairly light it approaches its victim on the shadow side, thus especially attacking the ankles under a writing table, or the hands under the head during siesta. It bites after dark if there be artificial light in the room. It does not bite out of doors in ordinary bright daylight.

The above habits, together with the fact of its being a house mosquito and the infected insects being mainly confined to dwelling houses, explains the *comparative* safety of "day-light communication" i. e., entering a town only after 10 A. M. and leaving by 4 P. M. under pledge to go in only on sunny days and to enter no residence; sometimes not to go into the residence portion of the city. The danger of staying all night was really the danger of the late afternoon, early evening, and morning hours and in residences.

(f.) Hybernation.

Many species of mosquito are known to hybernate, some as adults, some as wrigglers and some doubtless as both. L. O. Howard, as quoted by Ross of the United States Navy states: "That the *Stegomyia* hybernates in the adult stage." I have not seen reported the instances on which this statement is based. Guiteras placed thirty-three mosquitoes in an ice box at 46.5° to 50° F. without food or water; three of them survived to the 87th day, when they were eaten by ants.

That the *species* habitually hybernates, i. e., exists quiescent through the winter, either as adult, larva or egg, is beyond dispute. Admitting that they hybernate as adults our experience with yellow fever teaches us that either but a small proportion of *infected* insects survive, as indeed the experience of Guiteras would indicate; or else that the power to convey yellow fever is *generally* lost after hybernation. For while there is much evidence, and it has generally been accepted, that yellow fever *occasionally* recrudesces after a winter of quiescence without re-

introduction, yet it is *certain* that this is not the rule. In a large majority of places where this species unquestionably hybernates, recrudescence of yellow fever after an epidemic has not occurred, and, even where it is claimed to have occurred, only a small proportion of the infection that existed when the epidemic ceased is observed in the beginning of the recrudescence. Unquestionably then, *Stegomyiae* capable of conveying infection at the beginning of cold weather are only exceptionally — and very exceptionally — capable of conveying it after a winter in the Gulf States. Of course it may be that the parasite dies in the hybernating host which survives.

(g.) Aerial conveyance.

Some mosquitoes are carried occasionally great distances aerially. The writer has personal knowledge of the flights of myriads of mosquitoes (*Culex Sollicitans* as he remembers them) which were carried by wind fifteen or eighteen miles from the Louisiana marshes across Chandeleur Sound to vessels in the sound and to Chandeleur Island. In both cases the wind had blown moderately and steadily for two or three days from the marshes. Other instances are reported; and, in spite of the general opinion of men far abler to express an opinion on the subject, the writer thinks from his observation afloat on salt water in the lee of islands and mosquito-infested shores that the *Culex* of the salt marshes is quite frequently carried considerably over a mile by light, steady breezes, long continued.

Is this true of *Stegomyia*? It is a far lighter insect, more fragile and apparently with very little wing power. It probably never flies high. It is found, by preference, near the ground, in the lower stories of houses and would thus be little liable to conveyance by wind, and its feeble power of flight should prevent its passage over any considerable distance by its own wing power. Nearly two years ago, the writer suggested that this problem be taken up, it being of importance in determining the anchorage of vessels in yellow fever ports. So far he knows of no direct observations on this subject, except those of Goldberger at Tampico and of Grubbs at Ship Island Quarantine. The latter found *Stegomyia* aboard three vessels from Vera Cruz, two of which claimed to have laid a half mile from shore. He believed they came aboard at Vera Cruz. The observations of Goldberger will be given later.

Although direct observations on this problem are few, yet there are certain *indirect* ones, bearing, however, entirely on the aerial conveyance of the *Stegomyia* infected with yellow fever. It is notorious that in town yellow fever is usually conveyed but a short ways aerially "across the street," or, more often "to the house in the rear," which is about as far as it was expected to be thus conveyed. This represents

a maximum distance of about 75 yards. The two longest distances recorded in recent times of aerial conveyance, one of 225 metres (Mèlier) and one of 76 fathoms — 456 feet — (the writer) are entirely exceptional. So much for the distance which the (infected) *Stegomyia* is conveyed — or rather usually conveyed — aerially.

On the other hand it is known that vessels moored in certain districts of the Havana harbor did not develop yellow fever aboard, except in those who had been ashore, or unless they lay close to other vessels which were infected. This experiment has been made on so large a scale — with so many vessels and for so many years — that we *must* accept as a fact that infected *Stegomyiae* were *not* conveyed aerially from the Havana shore to those vessels, or, allowing for errors, very rarely so conveyed. The distance which had been found safe was something over 250 fathoms — 1,500 feet. No minimum however had been established. The prevaling wind was generally slightly on shore, but was not constantly blowing. Whether there is any difference in the distance to which infected or non-infected mosquitoes are conveyed is of course entirely a matter of surmise. Yet the infected *Stegomyiae* have almost certainly become so in a house; and, with their very domestic habits, must be found out of doors, where they would be subject to conveyance by the wind, in much smaller numbers than the uninfected insects, and consequently a lesser *number* of them would be conveyed aerially. Observation is needed on this subject — the disance (across water) that *Stegomyiae* are aerially conveyed.

Goldberger, very ingeniously, suggests that on account of its diurnal flight, the direction of the wind during the *day only* need be considered in estimating this factor in their aerial conveyance, and states that at Tampico, he has failed to find *Stegomyia* aboard vessels lying for ten or fifteen days about half a mile from a shore where they were abundant, while numbers of *Anopheles albipes* and *Culex pungens* were found. The wind was on shore during the day and calm or off shore during the night. The importance of this point is obvious, as on the coast, except when overborne by the trades, the direction of the wind is very generally different by day and night.

To sum up.

Among the special characteristics of the *Stegomyia* which affect its role as a carrier of yellow fever are:

1. Its distribution.

This is, generally, between lats. 43 N. and 43 S. on the coasts and low plains of Africa, Asia, and the adjacent islands; Australia and the Mediterranean basin of Europe.

It is also general on the eastern coast of America from 38 N. to 35

S. Lat. On the west coast it is found at Panama and Guyaquil, and its existence is *implied* from Guyaquil to Acapulco.

In the United States it is general on the coast and low plains of the southern states, except Maryland.

2. That it is conveyed by vessels indefinite distances (from Cape Town to Savannah Quarantine); in much greater numbers and more often by sail than by steam vessels.

3. That it lives a long time — 154 days being recorded by Guiteras of an infected insect.

4. That once having acquired the power of transmitting yellow fever it retains it apparently as long as it lives — 59 days being recorded.

A consideration of the four postulates above will render it advisable to safeguard the tropical countries of the east when communication is opened up between them and American ports infected with yellow fever, preferably by freeing the American ports of yellow fever.

5. That it propagates preferably in artificial containers, but will propagate in pools where such containers are not available.

6. That in America it has been reported only in the vicinity of human dwellings and seems here not to be a sylvan, paludal, or campestral mosquito.

From 5 and 6 the war against this insect in America should be waged about the houses of men, and especially against water in artificial containers. The introduction of a water supply, piped to every house so as to do away with cisterns and water jars, is the most important measure of sanitary engineering to free a town of this mosquito. Next to this is a system of drainage by covered drains to carry off the rain water and prevent pools. Cess-pools are not objectionable on this score.

7. It unquestionably hybernates in the United States, either as adult larva or egg, but if the *infected adult* hybernates, either a very large proportion of them die, or else the infecting parasite must *generally* die in the hybernating mosquito. The first seems more probable.

8. It is essentially a house mosquito, and is inclined to stay about the premises where it has fed. Hence the greater safety of the wholesale district of an infected city as compared with the residence portion.

9. It does not feed in the dark or in bright sunlight. Therefore in bright daylight or at night without artificial light are the safest times to be in an infected place.

10. The cycle of the yellow fever parasite in the mosquito before it can be conveyed to man is generally, in hot weather, about fourteen days or over. Prior to the accomplishment of this cycle (once called

the "extrinsic incubation of yellow fever") the mosquito cannot convey this disease.

11. It is probably usually conveyed aerially less than 100 yards. In Havana the *infected* insect is believed not to be aerially conveyed 250 fathoms — 1,500 feet — from the Havana shore.

The direction of the prevailing wind *during the day* influences its aerial conveyance.

PERIOD OF THE DISEASE IN MAN DURING WHICH YELLOW FEVER CAN BE TRANSMITTED TO THE MOSQUITO.

By Col. W. C. GORGAS,
Assistant Surgeon-General U. S. Army, Washington, D. C.

Since the publication of the work of the Army Medical Board, of which Major Reed was Chairman, concerning the etiology of yellow fever, a great deal of work has been done with respect to this disease, and some knowledge added to our present store concerning it. The most important, probably, is the work of the yellow fever board of the Public Health and Marine Hospital Service at Vera Cruz, Mexico, which has recently been published. They give very strong evidence that they have discovered a micro-organism closely related to yellow fever. They find that organism in the salivary glands of infected mosquitoes, which they do not find in the glands of uninfected mosquitoes of the same species. This, it seems to me, is a very helpful step toward discovering the organism which causes yellow fever, but there is still a wide field for work in clearing up obscure points in the etiology of this disease. One point as to which there seems to be a very general misconception, is with regard to the period during which a patient suffering from yellow fever can convey the disease to the mosquito. Every writer, in my knowledge, who refers to this subject, states that the mosquito can become contaminated only within the first three days of the disease in the human being. Manson, in his last edition, page 192, states as follows: "Duration of the infective period — This is singularly circumscribed. The American observers have shown that a yellow fever patient is dangerous to his neighbors only during the first three days of the disease. After this he cannot confer infection."

Major R. H. Firth, Royal Army Medical Corps, in the Report of the Army Medical Department for the year 1901, Vol. XLIII, page 364, says: "A further important fact has been established, namely, as to when a yellow fever patient is infectious, that is, capable of infecting mosquitoes. He appears to be infectious only during the first three days of the disease; therefore, if the patient is protected with a fine mesh screen during the first or infectious stage, he ceases thereafter to be a source of danger to anyone." And others make this same statement. These statements probably arise from the fact that the conclusions arrived at by the Army Board, conclude that if a female *Stegomyia* mosquito bites a human being suffering from yellow fever,

within the first three days of the disease, she can transmit it, etc. The Board mean to state by this, the fact that a female *Stegomyia* mosquito, contaminated within that period, may transmit the disease, but do not mean to assert at all that one infected after the third day will not transmit the disease. While mosquitoes were applied to yellow fever patients after the third day, and failed to transmit the disease, there were other causes for this failure, and they were unable to make any positive statement with regard to its communicability after that period. Writers on the subject have probably dropped into error, misunderstanding the statement of the Board, concluding from their languge in stating that *Stegomyia* mosquito biting within the first three days, could transmit the disease, that one biting after that period could not transmit. From conversation with the late Dr. Reed on the subject, I found out that he did not at all hold the view that the disease could not be communicated to the mosquito after this period, and Dr. Carroll also writes me to this effect. All that their conclusions meant to convey was the positive fact that the disease could be communicated within the first three days, and as they made no experiments with mosquitoes infected after that period, they could draw no conclusions. I, myself, though on the ground with the experimenters and seeing all their work, came to the same conclusion, namely, that the disease could not be communicated after the third day, and have so stated in articles on the subject. My friend, Dr. Ross, of the Navy, the Chairman of the committee, also makes the same statement, and Colonel Havard, of the Army, does the same. Both these gentlemen were on the ground, and in touch with the experiments as they were going along. This is a very important and vital point, and ought to be settled at an early date. If a patient cannot infect the mosquito after the third day of his disease, precautions to prevent his being bitten by the mosquito should be laid aside after that time. This would be of very great assistance to the practical sanitary officer. Everything that minimizes the trouble and inconvenience to the people at large, in enforcing sanitary measures, is a great help in popularizing these measures, and in preventing opposition to their enforcement. If the sanitary officer, at the end of the third day, could withdraw his guard, and leave all isolation of the patient to the family concerned, it would be a great step in the practicability of enforcing sanitary measures against yellow fever. But if this is not so, and a mosquito can become infected at a later period of the disease, a fatal error would have been committed by so doing, and the disease would probably spread, just as if no isolation had been attempted. So far as I know, there is no evidence whatever to show that the disease is not infectious after the third day, except the fact that in all transmitted

cases, the mosquitoes were infected within the third day of the disease, and no attempts were made to infect mosquitoes after this period. The Board were endeavoring to prove that yellow fever could be transmitted by the mosquito. It happened that the mosquitoes at first used were infected within the first three days, and to be sure of transmitting the disease in infecting subsequent mosquitoes, they followed exactly the methods that had been used in the first cases. With our present knowledge on this subject, I think that a yellow fever patient should be carefully protected from mosquitoes until convalescence is well established, and that the same care should be taken with regard to the bodies of the dead. Whether the mosquito will, or can, feed upon a dead body, I do not know. I think it probable that she will be unable to get blood after circulation has ceased, but until we have more positive knowledge on this subject, sanitarians should guard against the possibility of the spread of the disease from this source.

NEW ASPECTS OF YELLOW FEVER ETIOLOGY ARISING FROM EXPERIMENTAL FINDINGS OF THE LAST THREE YEARS.

By Dr. CARLOS J. FINLAY, Havana, Cuba.

In the light of modern research yellow fever must now be considered as a disease produced, in individuals belonging to certain human races, by a two-host, microscopic, perhaps ultra-microscopic germ, endo-parasite of the female of a particular species of mosquito — the *Stegomyia fasciata* (Theobald).

This germ pursues its parasitic existence in the body of the infected *Stegomyia* during a period of fifty-nine days, as experiments have proved, and probably, under ordinary circumstances till the death of the mosquito host.

In order, however, that it may complete its life cycle, secure the perpetuation of its species, and find its way into the body of other healthy *Stegomyia,* it is necessary that it, the aforesaid germ or parasite, should penetrate, through the bit of the infected insect into the body of a person who is liable to undergo an attack of yellow fever.

After parting from its mosquito-host, the germ, apparently, goes through certain evolutions in the body of the non-immune, and, after the lapse of from three to five days, as a rule, brings about the attack of yellow fever. What the character of thsee evolutions may be can only be surmised. We do know, however, that while the sojourn of the germ in the body of the infected *Stegomyia* may continue during at least two months without perceptibly affecting the longevity or the functional activity of its insect-host, its presence in the human-host only reveals itself during a short number of days, disappearing, apparently, by the end of the sixth day, without leaving any other trace of its passage through the human-host except the immunity which a first attack of yellow fever confers. The person thus immunized can, thereafter, receive with impunity the bites of any number of infected *Stegomyias* and become incapacitated from contributing again to the perpetuation of the germ.

Since the first day of the attack of yellow fever (as early as the ninth hour in one of Dr. Carroll's cases) any healthy *Stegomyia* that bites the patient is liable to become infected, so that a new life cycle will be opened for the germ in this fresh *Stegomyia.* Thus by alternately passing from the human to the mosquito-host and vice versa, the yellow fever germ has now lived during several consecutive cen-

turies in tropical America, where both the aborigines and the European invaders belonged to susceptible races.

Now, let us consider the probable character of the evolutions which the yellow fever germ undergoes in the body of the human host. Bearing in mind the fact that other two-host protozoa such as the malaria parasite, lead during several consecutive months a parasitic existence multiplying by schizogonia, forming schizonts, merozoits and after awhile also gametes, in the body of their permanent host, and are unable to accomplish the sexual reproduction indispensable for the perpetuation of their species, unless they pass into the body of a second host — (the *Anopheles,* in the case of the malaria parasite); bearing all this in mind, I say, are we not justified in supposing that the yellow fever parasite being unable to accomplish this sexual reproduction in the body of its permanent mosquito-host, can only succeed in doing so by passing into the body of a non-immune human being after some of its elements have reached a stage of sexual differentiation corresponding to the gametes of malaria? There is, moreover, another important consideration which may be adduced in support of this interpretation. The large tertian parasite untreated may continue for many months in the body of infected persons without immediate danger to the patient, whereas Grassi, I am informed, has found all the *Anopheles* in the Roman marshes, free from parasites during the winter season, so that all the infected ones must have died in consequence of their infection, and the renewal of the malaria epidemic in the following spring is attributed to the survival of the parasites in the body of the human permanent-host. This shows that the act of sexual reproduction is attended with more dangerous results for the host in which it is accomplished than happens during the various schizogonic phases of the same germ: A result which I had already surmised by reason of the greater metabolic changes which must accompany the sexual reproduction as compared with the schizogonic multiplication.

If it be admitted, therefore, that the penetration of the germ into the body of the non-immune is intended for the accomplishment of its sexual reproduction, and also that the analogy between it and the malaria parasite holds good, with the difference only that the latter accomplishes this act in the *Anopheles* mosquito while the yellow fever germ does so in the human host, the following important inferences may be drawn.

The minimum number of days (estimated at 10 or 12 by the Yellow Fever Army Board) which must elapse after the *Stegomyia* has bitten a yellow fever patient before the infected insect is able to inoculate

the disease through its bites, must represent a series of transformations in the body of the contaminated mosquito, including:

(*a*) The introduction of young sporozoits sucked up with the blood of the patient.

(*b*) Growth of the sporozoits to adult age.

(*c*) Formation of schizonts and merozoits.

(*d*) Formation of gametes.

While in the body of the non-immune, counting from the moment of his inoculation by the infected *Stegomyia*, the following stages are likely to take place during the period of incubation:

(*a*) Localization of the gametes in appropriate sites.

(*b*) Fecundation of the macro by the micro-gametes of the yellow fever germ.

(*c*) Formation of the oökinet and the development of the oöcyst in appropriate cells (enclothelial?)

(*d*) Discharges of the free sporozoits of yellow fever into the circulating blood (perhaps too small to be recognized with a microscope).

(*e*) Development of the toxemic symptoms characteristic of the invasion of yellow fever, in the inoculated non-immune.

In calling your attention to this correlation of ideas, my object is not the display of fanciful conceptions, but simply to comply with my belief that unless we map out for ourselves some working hypothesis of this kind, we shall continue groping in the dark with little hope of ever completing our knowledge of the yellow fever eitology.

CONCERNING THE GEOGRAPHIC DISTRIBUTION OF THE YELLOW FEVER MOSQUITO.

By L. O. HOWARD, Ph. D.,

Chief Entomologist, U. S. Department of Agriculture; Hon. Curator of Insects, U. S. National Museum; Consulting Entomologist, U. S. Public Health and Marine Hospital Service, Washington, D. C.

The proper consideration of this now all-important species must necessarily be divided into two sections; first, the actual present distribution of the species so far as it can be ascertained; second, the exact limitations of the regions in which, if accidentally introduced, it may reasonably be expected to propagate and to become perfectly established. For immediate quarantine purposes the first of these is the most important, but looking to the future, an exact knowledge of the regions which must be included in the second category, is obviously scarcely less important.

I. THE PRESENT KNOWN DISTRIBUTION OF THE SPECIES.

When Mr. F. V. Theobald published his two volumes "A Monograph of the Culicidæ of the World," in 1901, he stated roughly that *Stegomyia fasciata*, which at that time was not known to him as the "yellow fever" mosquito, ranged from 38° S. Lat. to 38° N. Lat., and his map upon p. 292, Vol. I, indicated a general distribution throughout eastern Australia; western Sumatra; all of Java and farther India; southern Japan; eastern Hindostan; the Seychelles; southeastern Africa; the African West Coast, including Senegambia; and the District Lagos; all of Spain; southern Italy; the east coast of South America from British Guiana to Rio de la Plata; all of Cuba; Jamaica; Hayti; and all of the southern United States. In volume III of this important monograph, published in 1903, the same author includes the following under *"New Localities"*: St. Kitts, Nevis, Antigua, Carriacou (Grenadine Islands), Trinidad (Hewlett), Barbadoes, Dominica, Montserrat (Low) Luzon, Philippine Islands (Sept. 7, '01, Miss C. S. Ludlow); Port Darwin, South Australia; Para (Durham); Gambia (Burdett), taken in houses, McCarthy Islands, in July; Victoria, Seychelles (Denman); Nigeria (Hanley); Fiji (Hewlett). Elsewhere he adds: Tyre and Sidon, Palestine; old Calabar; Mashonaland; Malay Peninsula and Eastern Archipelago; Argentine, South America.

In my book on mosquitoes, published in 1901, I gave the then known distribution in the United States as follows: "In the United States it is common in most of our Southern States. I have seen specimens from New Orleans, La.; Natchitoches, La.; and Napoleonville, La.; eastern Texas; Hot Springs, Ark.; Pelham, Ga.; Virginia Beach, Va." Since that time many new localities have been discovered, and our present knowledge of the exact localities may be tabulated as follows:

UNITED STATES.

Virginia, — Virginia Beach. *Kentucky,* — Lexington. *Illinois,* — Cairo. *Tennessee,* — Nashville. *Arkansas,* — Hot Springs. *Louisiana,* — Ruddock, New Orleans, Baton Rouge, Napoleonville, Hammond, Shreveport, Franklin. *Mississippi,* — Pass Christian, Summit, Quarantine Station, Biloxi. *Georgia,* — Atlanta, Pelham, Augusta, Savannah, Brunswick. *Florida,* — Barrancas, Key West. *Texas,* — Galveston, Houston, Victoria, San Diego, Tyler. *South Carolina,* — Charleston, Sullivan's Island. *Maryland,* — Baltimore (Carter) — breeding in fresh water on fruit wharf. *North Carolina,* — Beaufort, Winston.

MEXICO.

Tampico, Acapulco, Guanajuato, Frontera, Vera Cruz, La Paz (Lower California), Coatzocoalcos, Pachuco, Tuxpan, Nautla, Tlacotalpam, Mazatlan, San Blas, Carmen, Cozumel, Champoton, Perihuete, Las Peñas.

They have been received from *British Honduras,* — Belize; *Nicaragua,* — Blue Fields; *Costa Rica,* — Limon, and Bocas del Toro; and have also been received from one of the low lying localities not specifically designated.

From the *Hawaiian Islands* they have been received from Honolulu and Hilo.

They were collected by my assistant, Mr. Marlatt, in *Java* at Batavia, Soekaboemi, Garoet and at Singapore, *Malay Peninsula.*

From the *Philippine Islands* they have been received from Iligan, Mindanao; and from Haganoy and Bulacan, Luzon; also from Iloilo.

In *Cuba* they have been received from Columbia Barracks, Havana; from Guantanamo, Daiquiri, Baracoa, San Antonio de los Banos, Cayamas, "Yaquaramoa," and the Isle of Pines.

From the British West Indies they have been received from Jamaica, and Montserrat.

Bahama Islands: Nassau, Spanish Wells, Harbor Island, Current, Tarpon Bay, San Salvador, Long Island, and Government Harbor.

Brazil: Campinas.

No European specimens have been received, but a very interesting locality has turned up in Ismailia, Egypt, whence specimens were received from Dr. W. C. Gorgas, of the U. S. Army.

From the above it will be seen that although the actual localities which may specifically be designated from the United States, are comparatively small in number, and that although combining Theobald's list with our own, the actual localities from other parts of the world are equally sparse, we have still sufficient facts to enable, in my opinion, a sound generalization, both as to probable actual occurrence, and as to regions in which the species will readily establish itself if once introduced. It will be noticed that all of the occurrences with the United States, except Lexington, fall within the limits of what are known as the tropical and Lower Austral Zones. These life zones include practically all of the southern United States which border on the Atlantic Ocean and the Gulf of Mexico, with the exception of those portions of Virginia, North and South Carolina, Georgia, and Alabama, which constitute practically the foot-hills of the Appalachian chain; in other words, western Virginia and North Carolina, the extreme northwestern corner of South Carolina, the northern part of Georgia and the extreme northeastern corner of Alabama. Further than this the Lower Austral Zone includes the western half of Tennessee, the western corner of Kentucky, the extreme southern tip of Illinois, the southeastern corner of Missouri, and all of Arkansas, except the northern portion. It also includes the southern portion of Indian Territory, southern Arizona, and some of northern Arizona; and southern strips in Utah, Nevada, and California.

In the greater part of the territory thus indicated, and *where the climate is not too dry, Stegomyia fasciata* will, with little doubt, upon close search, be found.

2. THE EXACT LIMITATIONS OF THE REGIONS IN WHICH, IF ACCIDENTALLY INTRODUCED, IT MAY REASONABLY BE EXPECTED TO PROPAGATE, AND TO BECOME PERFECTLY ESTABLISHED.

All the rest of the Lower Austral Territory just indicated, and *where the climate is not too dry,* will constitute a region where the yellow fever mosquito, if once introduced, will undoubtedly flourish. Even in the drier portions of western Texas, southern New Mexico, Arizona, southern California, southern Nevada, and southern and northern Arizona where the climate is exceptionally dry, there is a possibility that this species, if once introduced, will breed in the water supply of ranches, except possibly, where the water is impregnated with alkali.

Having made this generalization for the United States, where through the admirable work of Dr. C. Hart Merriam and his Division of Biological Survey of the United States Department of Agriculture, the subject of the exact limitations of the life zones has been so accurately investigated, and where these zones have been so carefully mapped out, we naturally may follow it with a corresponding generalization for other countries, where the factors which control the distribution of animal and vegetable life are, of course, comparable to those which exist in the United States. We may expect to find this species everywhere in the moist tropics, or at all events, when introduced at any point within the moist tropics, it may be expected to establish itself. The conditions which control the distribution of life in the so-called Lower Austral Zone, will naturally hold equally in corresponding sections elsewhere, and it becomes necessary to formulate as easy a means as possible of ascertaining a region between the parallels of latitude of 38° N. and 38° S., whose condition will correspond to those of the Lower Austral Zone in the United States, and which will thus admit of the breeding of *Stegomyia fasciata*. It has been determined by Dr. Merriam that the northern limit of the Lower Austral Zone is marked by the isotherm showing a sum of normal, positive temperatures of ten thousand degrees centigrade or eighteen thousand degrees Fahrenheit. The sum of normal positive temperatures, means the sum of normal mean daily temperatures above six degrees centigrade, or forty-three degrees Fahrenheit. With this rule as a basis we may take, for example, on the borders of the plateau region in Mexico, any given locality, or elevation, and may sum up the normal mean daily temperatures above six degrees centigrade, or forty-three degrees Fahrenheit, and if this sum for the year reaches ten thousand degrees centigrade, or eighteen thousand degrees Fahrenheit, it is safe to say that the locality is within the limits of the Upper Austral Life Zone, and that the yellow fever mosquito will breed there.

The minimum temperature of six degrees centigrade, or forty-three degrees Fahrenheit, has been estimated as marking the inception of reproductive activity in animals; in other words, the formula which we have just given means that the physiological constant of *Stegomyia fasciata* is approximately ten thousand degrees centigrade. I have, in the opening paragraph under this head, italicised the clause "where the climate is not too dry," for while the temperature predetermines the possibilities of distribution, and fixes the limits beyond which the species cannot pass, and defines certain broad transcontinental belts within which certain forms may thrive, *if other conditions permit*, it is by no means the sole factor which determines distribution. Never-

theless, other conditions being never so favorable, the species possessing the physiological constant characteristic of this zone, cannot exist outside. With mosquitoes it is obvious that the factor next in importance to temperature, will be moisture, and in the arid tropics, and in the very dry portions of the Upper Austral Zone, we will not naturally look for an abundance of mosquitoes, except under artificial conditions brought about by civilization. *Stegomyia fasciata,* however, being a domestic species, that is to say being practically dependent upon the conditions surrounding human habitations, is less subject to normal conditions of moisture, than are the species of the fields and woods.

It is interesting to note that the geographic distribution of the yellow fever mosquito corresponds rather well with that of the Texas cattle tick (*Boophilus annulatus*) which is instrumental in the carriage of the haematozoan of Texas fever. That too is a creature which seems confined to the tropical and Lower Austral Zones.

The southern border of the Austral Zone has not been expressed in a similar formula, but this is unnecessary for the present consideration, since the mosquito breeds readily in both tropical and Upper Austral Zones.

The southern limit of the zone in the southern hemisphere, corresponding to the northern limits of the Upper Austral Life Zone in the northern hemisphere, can probably be calculated by the use of the same formula, and thus in any given locality in the southern hemisphere the probable occurrence, or at all events the proper climatic conditions for the existence of *Stegomyia fasciata,* can be ascertained.

I conceive that the facts thus formulated, are, and will be, of great importance in the determination of quarantine measures, and that the careful records which have been urged by the International Congress of Sanitarians of the American Republics will justify these broad conclusions.

In an article published in the Journal of Tropical Medicine, for August 1, 1903, Mr. Theobald gives some further notes concerning the distribution of other species of *Stegomyia,* in which he shows a slightly greater northern and southern distribution, with other forms of the same genus, enlarging the field to from 43° S. to 43° N. latitude. As yet, however, the agency of only a single species, *Stegomyia fasciata,* in the transfer of yellow fever, has been proven. Let us, for the present, await experimentation with other species, — *S. africana, S. argenteopuncta, S. notoscripta, S. sugnes* and *S. scutellaris,* — before beginning further attempts at generalization. In fact it may very likely be shown that these species have not so close a relationship to

S. fasciata as to warrant the belief that they may be instrumental in the carriage of disease. In fact the Australian species *Stegomyia notoscripta,* laying its eggs as it does in "rafts," and not singly as does *S. fasciata* may very likely prove to be a distant, rather than a close, relative of the dangerous form.

THE MOSQUITOES IN MEXICO CITY.

By Dr. LUIS E. RUIZ, Mexico, D. F.

I.

THE PROBLEM.

One of the interesting subjects of hygiene and therefore one which has the greatest importance for public health, is that which refers to transmissible diseases.

What is their cause; what is the law that rules them, and what is the mechanism of their transmission? These are the points that it is necessary to resolve for instituting the prophylaxis of these diseases that only then can be entirely efficacious.

That these diseases are caused by micro-organisms is a knowledge completely acquired.

That these pathogenic agents come into our organism with the air we inspire or with the food we take, or, breaking through the surface of the body by breaks in the skin or in the mucous membranes, is another knowledge that we have conquered.

But in this third case the cause is not always the contact of contaminated objects with the injured skin; many times it is the intermediation of an animal that takes the germ from a sick person and brings it to a healthy one.

Examples: Paludism, yellow fever and the plague, the intermediaries being, for the first, the anopheles, for the second, the *Stegomyia;* (both mosquitoes) and for the third, the flea.

From the moment we know that mosquitoes, so abundant and of so many kinds in many places, are the sure vehicle for the transmission of certain diseases, we are obliged to study them, to identify them and to scutinize their life in order to put into practice the knowledge that we may acquire a complete efficacious prophylaxis for preventing these diseases.

In Mexico there are only two classes of mosquitoes, but some other classes either dangerous or contaminated can be brought into the city through the railroads that run from some points of the territory to the capital.

To state which are the former and to identify the latter, giving the watch-word against them, is the object of this imperfect essay.

II.

THE ONES THAT LIVE IN THE CITY.

Two classes of mosquitoes, well known, live in Mexico city; one class that only lives in the beautiful grove "Chaputepec" and another that lives in all the city. The first has been existing for centuries and the existence of the second was ascertained in 1885.

a. In "Chapultepec" lives the class called *"Culex impiger"* (Mr. Howard said that it swarms in North America, Canada and Ottawa) which is different in size and form from the class that lives in the city.

They have no tendency to go into the houses in the afternoon, but flutter in the morning when they sting, and their stings are very irritating. As we see, their life is different from the life of other mosquitoes, and we must take this into consideration in the manner of destroying them.

b. In Mexico city, in the year 1885 appeared a class of mosquitoes called *"Culex pungens"* (which has ever lived in the United States over a great territory from New England to California).

These, contrary to the ones of "Chapultepec," shun light (photophobia) and that is the reason why at dusk they have the tendency to go into the houses, or if they are in the rooms begin to fly from one part to another, and during the night they sting and bother the inmates.

In general, though leaving a visible mark, their sting irritates less than that of the others.

By their great proliferation they have invaded all the city; the principal foci for their development are the canals and stagnant waters that are found in great quantity in "Guerrero" streets and in the "Calzada da la V[illegible]; in those quarters they are really swarming.

This having been ascertained after careful and patient investigations over all the city of Mexico, it is irrevocably fixed that there are neither *Stegomyia* nor *Anopheles* in the place.

III.

THE MOSQUITOES THAT CAN COME TO THE CITY.

To ascertain whether mosquitoes can come from another part to settle in the city, a double study was made, 1st: scientific considerations about the life of these diptera and of the climatological circumstances of the valley of Mexico, bearing in mind the railroads that reach the capital, and 2nd, ascertainment of the arrival at the city and the permanence therein of some mosquitoes.

It is convenient to bear in mind that as far as we are concerned, only the females of these diptera are dangerous. When they are completely developed and the new generation is going to commence, they need a supply of nitrogenous food that they cannot get from the juice of plants, and then they begin to be very voracious and attack man. They hum, flutter, and to sting they introduce the trunk through which they spill an irritating saliva, they also bring out the blood that is sucked by them.

They search for a living in the lower part of the atmosphere, and the dry air is favorable for them; the stagnant waters and the gardens make possible their propagation and principal alimenation, and they increase prodigiously in number.

They are attracted by the red and blue colors that are less shining and they shun the white and yellow which are more luminous.

The climatological conditions of the beautiful valley of Mexico are especially propitious for them.

The air is dry, and the large valley has not only extensive lakes but also many canals, pools, great portions of stagnant waters, and also a variegated and rich vegetation, quite proper for these insects.

From the different parts of the valley run electric cars to the capital and it has been ascertained that in some of these places sometimes there are *Anopheles.* (*Duges*). The railroad trains that arrive in Mexico city come from the North, the Gulf, the Pacific and its vicinity, and from the Southern region.

In order to resolve the last point in this essay two classes of facts have been ascertained; 1, technical ascertainment of the mosquitoes existing in the starting points of the railroads and 2, experimental determination of the arrival of those mosquitoes in the capital.

a. In the North the *Culex pungens* exists over a great extent. (*Howard*).

b. In Tampico, Tuxpan, Nautla, Veracruz, Coatzacoalcos, Frontera and Carmen which are ports of the Mexican Gulf, exists the *Steomyia fasciata.* And in Tampico, Nautla and Progreso the *Anopheles.* (*Duges.*)

c. In la Paz, Mazatlan, San Blas and Acapulco that are ports of the Pacific Ocean, is found the *Stegomyia.*

d. In Yautepec, that belongs to the southern region, lives the *Anopheles.* (*Herrera*).

As showing the possibility of the arrival in the city of some classes of mosquitoes brought by the railroad trains, is the fact, already admitted, that the *Culex pungens* was brought by the railroads from the North, in February, 1885.

The *Anopheles,* found in a very small number in the southern part of the valley of Mexico where it has not been possible to find any larvae, was also brought from the southern region through the inter-oceanic railroad.

But up to this day we have not found any mosquitoes from remote places notwithstanding that we have looked for them very closely and that we have put in the freight cars, that come from those regions, capsules with a syrup made of a plant called *"yerba de la cucaracha."*

IV.

CONCLUSIONS.

1. It is proved that the classes of mosquitoes called *Culex pungens* and *Culex impiger,* exist in Mexico city.
2. That in Mexico city there were no *Stegomyia* or *Anopheles.*
3. That in the ports of the Mexican Republic exist the *Stegomyia* and the *Anopheles.*
4. That in the hot land of the south exists the *Anopheles.*
5. That in conditions, not well determined yet, the transportation of mosquitoes is possible.
6. From all the preceding conclusions we may infer: "that it is absolutely indispensable to proceed methodically to the destruction of the noxious classes of mosquitoes, employing all the means of which the efficiency has been demonstrated by experience.

QUARANTINE REGULATIONS SHOULD BE BASED AGAINST YELLOW FEVER UPON THE DOCTRINE THAT IT IS ONLY CONVEYED BY THE MOSQUITO.

By J. M. LINDSLEY, M. D., Havana, Cuba.

It is now a fact universally accepted by scientists that the mosquito known as the *"Stegomyia fasciata"* is the only natural means by which yellow fever is transmitted. In 1881 Dr. Carlos J. Finlay of Havana, Cuba, advanced the theory that yellow fever was not contagious or infectious, but was transmitted by the bite of the mosquito. His proof was so plausible in the estimation of the English physicians who had been watching the experiments of Ross and Manson in regard to malarial fever, that as early as 1888 the Finlay theory was laid down in text book.*

After the American occupation of Havana, Cuba, the United States War Department appointed a commission to investigate the mosquito as a carrier of yellow fever. This commission, composed of Drs. Reed, Carroll, Lazear and Agramonte, after a series of experiments came to the conclusion that yellow fever was transmitted by the *Stegomyia fasciata* and that their experiments with fomites failed to produce a single case.

Before the Pan American Medical Congress held in Havana in February, 1901, a second report was submitted by Major Reed, which follows:

1. "The mosquito *fasciatus* serves as the intermediate host for the parasite of yellow fever.

2. Yellow fever is transmitted to the non-immune individual by the bite of the mosquito that has previously fed on the blood of those sick with this disease."

3. An interval of about thirteen days or more after contamination appears to be necessary before the mosquito is capable of conveying the infection.

4. The bite of the mosquito at an earlier period after contamination does not appear to confer any immunity against a subsequent attack.

5. Yellow fever can also be experimentally produced by subcutaneous injection of blood taken from the general circulation during the first and second days of this disease.

* "The prevention of disease in tropical campaigns," by Dr. Andrew Duncan and others.

6. An attack of yellow fever produced by the bite of the mosquito confers immunity against the subsequent injection of the blood of an individual suffering from the nonexperimental form of this disease.

7. The period of incubation in 13 cases of experimental yellow fever has varied from forty-one hours to five days and seventeen hours.

8. While the mode of propagation of yellow fever has now been definitely determined, the specific cause of this disease remains to be discovered.

9. Yellow fever is not conveyed by fomites, and hence disinfection of articles of clothing, bedding, or merchandise, supposedly contaminated by contact with those sick of this disease, is unnecessary.

10. A house may be said to be infected with yellow fever only when there are present within its walls contaminated mosquitoes capable of conveying the parasite of this disease.

11. The spread of yellow fever can be most effectually controlled by measures directed to the destruction of mosquitoes and the protection of the sick against the bites of these insects.

In the Report of the Working Party I, Yellow Fever Institute, "A Study of the Etiology of Yellow Fever," by Herman B. Parker, Assistant Surgeon, Geo. E. Beyer, Acting Assistant Surgeon, O. L. Pothier, Acting Assistant Surgeon, of the Public Health and Marine Hospital Service, was made and published by the Treasury Department, March, 1903, from which I quote:

"The whole mass of corroborative evidence is that the *Stegomyia fasciata* is the medium for the transference of the disease. This is looked upon as a definite scientific fact. Is it, or is it not, the only means of transference? To prove a negative assertion conditions must be supplied to produce the disease at will or under constant conditions. In the whole history of the disease such data, to this date, are wanting, When one instance occurs and can be repeated the new factor can then be taken into consideration."

On May 13, 1903, I sent the following letter to physicians in Cuba and the United States:

1. "Do you believe that the mosquito is the only natural means by which yellow fever is conveyed?
2. If not, what other?"

The following replies were received accepting the mosquito theory as the only means of transmitting yellow fever:

Dr. W. C. Gorgas, Ass't Surgeon Gen., U. S. Army, and who had charge of sanitary work in Havana, 1898 to 1902:

NEW YORK CITY, May 27th, 1903.

"I believe that the *Stegomyia* mosquito is the only means in nature by which yellow fever is conveyed from person to person.

I hold that success of our sanitary work in Havana demonstrates this. During our work of eradicating that disease in 1901, we paid no attention to fomites of any kind, not only let the soiled clothing,

etc., go freely to the wash in the case of the sick in the city, but after its disappearance from the city, we placed no prohibition upon baggage and household goods coming in from infected suburbs. The non-immunes from these suburbs were not detained but merely inspected daily for six days. We had during the year 1,200 non-immunes come into the city from infected points, and from these 1,200 our inspectors picked up 26 cases of yellow fever. The conditions at Havana were about as unfavorable as could exist.

You will find an interesting discussion in the report of the seventeenth annual meeting of the "Conference of State and Provincial Boards of Health," which met last year at New Haven. A committee had been appointed the preceding year to report as to whether the disinfection of baggage was necessary in yellow fever. The report of this committee was that such disinfection was not necessary. I wish you success as it means a great deal in dollars and cents to the business interest of our Southern States."

Dr. V. Havard, Med. Dept., U. S. A.

WEST POINT, N. Y.

"In reply to the above would say that I believe the mosquito to be the only natural means by which yellow fever is conveyed. Any one who has read the accounts of our experiments in Havana and still believes in the power of fomites to produce yellow fever, must be deaf, dumb and blind."

Dr. James Carroll, Med. Dept., U. S. A.

WASHINGTON, May 16, 1903.

"I am thoroughly and firmly convinced that natural yellow fever is conveyed in no other way than through the bite of the mosquito. The transmission by that agent was first proved in my own person, August 31st, 1900, and this observation was subsequently confirmed by ourselves and by Guiteras. Our attempts to infect, by means of fomites, all resulted in failure and the same is true of the attempts made by Havard, Gorgas and Ross in the late summer of 1901.

The agency of the mosquito explains all the hitherto unexplainable facts in connection with the erratic course of the disease and its non-communicability in certain localities as well as the interval of time that must elapse between the appearance of the first and the occurrence of subsequent cases. This interval was seldom observed because the earliest cases of the disease have nearly always been called "bilious remittent fever," "dengue," or something else, until cases occurred with black vomit. Of our 22 consecutive cases of experimental yellow fever not one had black vomit, though some of them were severe. Guiteras lost three out of eight experimental cases with black vomit, so there is no room for doubt as to the genuine nature of the disease."

Dr. H. R. Carter, Surgeon P. H. and M. H. S.

1. "I believe that the mosquito *Stegomyia fasciata* is the only natural means of conveying yellow fever to man.

2. That this mosquito is infected in nature only by feeding on one sick of yellow fever."

Baltimore, May 22, 1903.

Dr. R. D. Murray, Surgeon P. H. and M. H. S.

Answer to first question—"Yes."
Answer to second question—"None."
Key West, Fla., May 23, 1903.

Dr. John W. Ross, Med. Director, U. S. Navy.

"I do believe that the only way in nature for man to contract yellow fever is from the mosquito (*Stegomyia*), or, in other words, that the mosquito is the only natural means by which yellow fever is conveyed to men seems absolutely demonstrated."
Washington, D. C., June 6th, 1903.

Carlos J. Finlay, M. D., Chief Sanitary Officer of Cuba, Havana:

In accordance with the request expressed in your circular of May 13th, my answers to your two questions are as follows:

1. I do firmly believe that the mosquito is the only natural means by which yellow fever is transmitted; my experience in Havana during the last months admitting of no other interpretation.

2. During that space of time ten (10) yellow fever patients imported from different Mexican ports have been conveyed from the vessels on which they had come or from the observation camp, across the bay, through the entire length of the streets of Havana, to Las Animas Hospital, and were there treated during consecutive weeks without the disease having ever been transmitted to the non-immunes who surrounded them. Now, considering that the only barrier which had been interposed between the said patients and the public or the other inmates of the hospital consisted in simple mosquito-bars or wire-netting of fourteen strands to the inch, this simple fact conclusively proves that the disease is not transmitted either by air-borne germs or by any blood-sucking insects which can find their way through the meshes of such netting. Indeed, consistently with all the observed facts I cannot think of any other means by which yellow fever may be transmitted except through the yellow fever mosquito.

John Guiteras, M. D., Havana:

The mosquito is the only proven natural means by which yellow fever is conveyed; and as all other means heretofore suggested have been proven not to be means of transmission of this disease, it is highly probable that the mosquito is the only means. I believe that it is the only means.

Aristides Agramonte, M. D., Havana, one of the commissioners appointed by the U. S. Army to investigate the cause of yellow fever:

Your favor of the 19th inst. has come to hand, and in answer, beg to state that I am convinced that the mosquito is the only natural means by which yellow fever is propagated.

There is absolutely no other way; this has been demonstrated in every manner within the power of man.

Extract from a letter from D. T. Lanie, M. D., Havana, Late Colonel U. S. V.:

The first question, I should answer: Yes, the mosquito is the only means by which yellow fever is conveyed.

Hugo Roberts, M. D., Quarantine Officer at the Port of Havana:

I have the honor to inform you that from all the experiments made in Havana, the only means by which we have been able to transmit yellow fever has been through previously infected mosquitoes.

All quarantine regulations against yellow fever in Cuba have been directed against mosquitoes and non-immune passengers from infected ports. No restrictions have been placed against fomites. That no case has appeared in this city, in spite of the close communication with infected countries, seems to confirm the theory that the mosquito is the sole agent of yellow fever transmission.

Q. Kohnke, Health Officer of New Orleans, La.:

1. I believe that yellow fever is conveyed from person to person by the *Stegomyia fasciata* mosquito only.
2. It may be possible, though it is not likely, that yellow fever is imported in some other way than by persons or mosquitoes.

A letter from S. E. Chaille, M. D., New Orleans, La.:

1. Do you believe that the mosquito is the only natural means by which yellow fever is conveyed? Yes, but I do not believe that this has yet been finally and conclusively proved.

From the foregoing evidence it is conclusive that no other means of transmitting yellow fever except the *Stegomyia fasciata* has been demonstrated. The question naturally arises, should quarantine regulations be based upon this fact. Dr. Havard, Assistant Surgeon General, U. S. Army, in command of the Island of Cuba, seeing the unnecessary hardship upon the traveling public and the great injustice of quarantine regulations, introduced the following resolutions at the Pan American Medical Congress held in Havana, Cuba, February, 1901:

Resolved:

1. "That the *Stegomyia fasciata,* is, up to the present time the only means demonstrated for the transmission of yellow fever.
2. In accordance with the above, prophylaxis should consist in the destruction, as far as possible, of this species of mosquito and the best means should be adopted to prevent these mosquitoes from gaining access to persons ill of yellow fever.
3. That quarantine measures against yellow fever shall be based thereon.

These resolutions were defeated. Dr. Glennon, Surgeon in command of Cuba, stated very forcibly that "We, the representatives

of the United States Marine Hospital Service, cannot accept the proposition in its present form, that it was necessary to bear in mind that in the reformation of quarantine regulations against yellow fever it is necessary to take into consideration the opinion of the health authorities of the southern United States."

It does not appear that the health officers of the Southern States are convinced that the mosquito is the only natural means by which yellow fever can be conveyed, although they accept, with practical unanimity the demonstrated facts showing that the mosquito does transmit the disease.

We find in report of Dr. Geo. R. Tabor, State Health Officer of Texas, for 1902:

"In 1900 the Chief Surgeon of the U. S. Army in Cuba appointed a commission which conducted a series of experiments with the purpose of determining the true cause of infection from yellow fever. In 1901 Surgeon Ross, of the U. S. Army, made similar experiments, and the conclusions of both were that 'yellow fever is not conveyed by fomites, and hence disinfection of articles of clothing, bedding, or merchandise, supposedly contaminated by contact with those sick with this disease is unnecessary.

"I cannot accept these conclusions, nor do I believe that they are accepted by any of the health authorities of the Gulf States, who, from long experience, know that yellow fever has been and believe it can now be conveyed by fomites.

"I am not prepared to give my consent to the introduction into this state, of articles of clothing, bedding, baggage, etc., which have been worn by and exposed to persons having yellow fever until it has been thoroughly disinfected; I agree that the mosquito can convey the disease, but I do not concede that it is the sole distributor thereof."

Dr. Joseph Y. Porter, Sanitary Inspector U. S. Public Health and Marine Hospital Service and State Health Officer of Florida:

1. "Do you believe that the mosquito is the only natural means by which yellow fever is conveyed?

I beg to say that I do not think as yet that question has been satisfactorily and definitely settled. The *Stegomyia fasciata* (female), may, or may not, be the sole and only medium of transmission of yellow fever to man. We need more time and experiments conducted in other countries except Cuba to determine the supposed or contended fact.

To your second query,

2. If not, what other? I answer, I do not know, but the history of many outbreaks of yellow fever in the past seems to point to fomites of various kinds as the conducting media.

To your third query,

3. Do you believe that the mosquito does convey yellow fever? Most certainly I believe that the female *Stegomyia* does convey yellow

fever. I do not think there is any doubt or dispute in the mind of any medical man on that point."

J. F. Hunter, M. D., Secretary and Executive Officer of the Mississippi State Board of Health, Jackson, Miss.:

Q. Do you believe that the mosquito is the only natural means by which yellow fever is conveyed?

A. I do not.

Q. If not, what other?

A. I believe that it is conveyed by fomites and that we have had several practical illustrations of same in this state.

Q. Do you believe that the mosquito does convey yellow fever?

A. If the experiments made in Havana were correct, I do.

Dr. Edmond Souchon, President of the Louisiana State Board of Health, in speaking of the Army Commission Report, says:

"The conclusion of the experimenters was, that as they had failed to convey yellow fever by fomites, the latter are no longer to be considered a source of danger.

Naturally, the very greatest importance has been attached to these experiments and to the conclusions based on them, as affecting quarantine methods.

The popular press especially has dwelt with marked emphasis on this phase of the subject in anticipation of a complete revolution in quarantine practice, with corresponding benefit to commerce.

While admitting that the mosquito has been shown to be a potent factor in conveying the disease, we southern health officers, charged with the grave duty of protecting our people against this most dreaded of all diseases, are unwilling to accept the dictum of the experimenters that yellow fever can be conveyed by no other agency."

Previous to the last meeting of the American Public Health Association the Havard resolutions were endorsed by twenty-two physicians in Havana and at the last meeting of this Association the same resolutions were unanimously endorsed by the delegates from Mexico and South America, and of members from the United States, fifty of those whose opinion were asked endorsed the resolutions, while only four declined to give their endorsements. These resolutions were then sent to the Surgeons General of the Army and Navy.

The Surgeon General of the United States Army endorsed as follows:

FIRST ENDORSEMENT.

War Department, Surgeon General's Office:

January 27, 1903.

Respectfully referred to Captain A. N. Stark, Ass't Surgeon U. S. Army, West Point, N. Y., for remark and recommendation.

R. W. O'REILLY,
Surgeon General, U. S. Army.

SECOND ENDORSEMENT.

WEST POINT, N. Y., January 28, 1903.

Respectfully returned with remark that the enclosed resolutions make up the sum total of our contention.

I signed the copy circulated at the meeting of the American Public Health Association as a medical man only. The official signature of the Surgeon General would carry great weight and more or less bind the Medical Department. Our representatives have conducted campaigns against yellow fever on the basis of Colonel Havard's resolutions and have striven to maintain the same at medical meetings, and therefore I recommend that the Surgeon General sign this paper.

A. N. STARK,
Capt. Ass't Surgeon, U. S. A.

THIRD ENDORSEMENT.

War Department, Surgeon General's Office:

January 30, 1903.

Respectfully returned to Dr. J. M. Lindsley, President International Quarantine League, Nashville, Tenn. It is believed that resolutions 1 and 2 represent the unanimous opinion of the medical officers of the Army, in which the Surgeon General fully concurs. The practical application of this or any other scientific proof in the matter of national quarantine does not come within the Province of the Medical Department of the Army, and the Surgeon General does not therefore feel called upon to express an opinion on resolution No. 3.

R. W. O'REILLY,
Surgeon General, U. S. Army.

The Surgeon General of the Navy wrote:

"Replying to your letter of the 24th inst. I take pleasure in endorsing the Havard resolutions to the effect that the *Stegomyia fasciata* is, up to the present time, the only means *demonstrated* for the transmission of yellow fever; also the second paragraph of these Resolutions, and the third that "quarantine measures against yellow fever shall be based thereon," with the qualification "until further knowledge is obtained of the means of transmission."

P. M. RIXEY.

It is evident that quarantine regulations should be based on demonstrated facts, and in the Medical Record, of October 26, 1901, Drs. Reed and Carroll, under the heading "Measures directed against the importation of yellow fever into the United States," we find the following proposed regulations for carryiing out scientifically the propsitions contained in the Havard resolutions:

1. "Under the admirable system of inspection and reports, as carried out by the Marine Hospital Service, the appearance of yellow fever

at any foreign port is promptly reported for the information of the health authorities of our several Atlantic ports. We may, therefore, divide foreign ports within the so-called epidemic zone into (a) infected, and (b) non-infected ports."

2. "If the disease has developed en route among the crew or passengers, the sick should be promptly removed; the forecastle, or staterooms, as the case may be, thoroughly disinfected with sulphur or formaldehyde gas, and the vessel allowed to proceed to her wharf."

3. "If more than twenty days have elapsed during the voyage, without the occurrence of yellow fever, we see no good reason why either passengers or vessel should be detained."

4. "With our present knowledge of its propagation, personal baggage should no longer be subjected to disinfection, and, with our increased ability to prevent its spread by measures of easy application, instances should be few and exceptional when a vessel coming from a yellow fever port should be delayed longer than will be necessary to remove her non-immune passengers who have not yet completed their period of five days since leaving the port of departure."

A practical demonstration of the measures necessary for protection against yellow fever when the mosquito theory is accepted, is furnished by Dr. Alvah H. Doty, Health Officer of the Port of New York, who outlines his practice in the Medical Record, October 26th, 1901, as follows:

"In accordance with the above views, the treatment of incoming vessels from ports infected with yellow fever becomes very simple; if they are five days or more in transit, and all on board are found to be well after a careful inspection and the use of the clinical thermometer, the vessel, its passengers and crew, shall be released without further detention or treatment. If the vessel has been less than five days in transit, all on board who cannot present satisfactory evidence of immunity should be removed and held for observation until the completion of a period of five days from the time of departure from the infected port, and then released only after a careful inspection. When yellow fever is found on incoming vessels, procedure should differ only so far as it concerns the removal of the patient to a properly constructed hospital or apartment for treatment."

The Southern States are the ones principally affected by the quarantine regulations against yellow fever. And the commercial importance of a scientific quarantine to them is a matter that the southern health officers cannot afford to ignore. Quarantine regulations based upon the mosquito theory and carried out by Dr. Doty of New York is well illustrated by the case of a steamship from a Mexican port to New York via Havana, eight days en route: Inspected, no sickness on board, allowed to wharf.

If sickness, remove the sick, disinfect mosquitoes, and allowed to wharf.

Compare with this case of a steamship entering New Orleans from Vera Cruz:

Sailed from Vera Cruz April 22d, arrived at Coatzacoalcos 23d, sailed May 1st, for Cardenas and Matanzas, Cuba, for sugar; arrived at New Orleans May 26th, disinfected and detained in quarantine five days.

This ship had not been in a Mexican port for twenty-five days and yet it was held for five days at New Orleans Quarantine Station after disinfection.

Likewise a steamship from Tampico to Mobile: Sailed from Tampico, May 16th, arrived at Havana 21st; disinfected, arrived at Mobile 24th — eight days from Tampico. Disinfected at Mobile and held five days. This vessel being held in Mobile cost in loss to cattle waiting at Tampico for the return of this vessel, sixty-four hundred dollars ($6,400.00).

Dr. Juan Guiteras has well said:

"The measure of success that has been thereby attained is such that we cannot help but regard with apprehension the evidence of unwillingness to accept this doctrine as the sole basis upon which the prophylaxis against yellow fever should rest. We are in possession of a specific treatment for the prevention of this disease. No other epidemic disease can be so perfectly controlled, and a grave responsibility rests upon the leaders of medical opinion who fail to educate their people and to prepare them in the practice of the new methods."

Scientific quarantine must evidently be uniform, recognizing the conditions under which yellow fever is conveyed. A geographical line, one side of which is "infectible" and the other side of which is "non-infectible" cannot be accepted as the basis for different quarantine regulations..

REPORT OF COMMITTEE ON THE PURIFICATION OF WATER SUPPLIES,

By GEORGE W. FULLER, Chairman, New York, N. Y.

From time to time for some years a committee of this Association has reported that it is feasible to render polluted waters pure and wholesome by means of filtration works. These reports have been based upon various current experiences and investigations, both in this country and abroad, and have led to scientific statements of the general conclusions which may be drawn regarding the purification of water supplies, the last of such statements being embodied in a report presented at the Indianapolis meeting in the autumn of 1900.

To-day, the case may be summed up, scientifically speaking, in a similar manner to that in the last report, so far as the more important fundamental principles are concerned. It is true, however, that there has recently been a substantial increase in our knowledge of the ways and means by which certain waters can be properly prepared for filtration, especially those extreme types such as the very muddy Mississippi River water at New Orleans and swamp waters highly charged with vegetable growths giving bad tastes and odors, such as the Ludlow supply of the city of Springfield, Mass.

As to ozone treatment, which at intervals has been attracting attention for some years, it is without doubt a successful means of eliminating disease germs under certain conditions on a small scale, but its cost in efficient practice appears to be very high. There are also some methods for the sterilization of water by means of chemicals, the use of ferric chloride and oxygen trichloride which, though worth of attention, have not yet passed beyond the laboratory stage.

To-day it is not the intention of this committee to say more as to the scientific status of methods of water purification. This is a period of practical accomplishments in this field, as shown by the number of important filter plants now being built, among which may be mentioned those at Washington, Philadelphia, New Haven, Providence, Louisville, Indianapolis, etc. It is believed that a progress report to this Association can now best be devoted to pointing out again how great a sanitary benefit filtration works have proved to be, and how important it is that filters be well built and well operated.

Filtration is sometimes referred to by its critics as being in an experimental stage. As a matter of fact, it is more than 70 years since the purification of municipal water supplies was first commenced at London, England. Much has been accomplished during that period

in showing the great sanitary value of pure water and purified water as testified to by the daily experiences year after year of more than twenty-five millions of people in Europe.

In America, sand filters were first introduced about 30 years ago, and a few mechanical filters were built in the 80's. Generally speaking, however, the great majority of the filter plants in America, aggregating about 200 in all, have been built within the past decade. It is important to realize clearly in this connection that many of these plants, particularly those of the mechanical type, are, from a construction standpoint, far from approaching the most efficient modern designs. While there exists in this country no such accumulaton of sharply defined evidence as to the efficiency of filters in protecting water consumers from typhoid fever and similar diseases as is the case abroad, yet there is sufficient evidence to allow the statement safely to be made that water purification in America is no longer in an experimental stage, and that satisfactory sanitary results will follow the adoption of filtration works, provided they are properly built and properly operated.

Sanitarians occasionally hear in this country of instances where typhoid fever is said to prevail in communities supplied with filtered water. Doubtless there are some cases where such conclusions are presumably fair and just, and which are explained by the filtration works being either constructed or operated in an unsatisfactory manner, if they are not at fault in both construction and operation. There are other cases where such critcisms are doubtless erroneous, because they disregard other means of transmitting typhoid fever than the public water supplies. In practically every instance careful inquiry into the facts shows special reasons and conditions explaining the various sweeping statements which are heard by sanitarians from time to time; and, notwithstanding these various incidents, the fact remains that well-built and well-operated filtration works are perfectly capable of producing a high grade of water from a sanitary standpoint.

It seems fitting before this group of sanitary officials upon this occasion to consider briefly upon what is based the conclusion as to the hygienic efficiency of filtration. As has been stated many times before this Association, we have, first, the analytical evidence, and second, the actual experience in the reduction of typhoid fever death rates in communities following the introduction of filtration works. In most instances the latter line of evidence is perhaps the stronger, and the one which appeals most keenly to the average water consumer.

In Europe the data obtained from the typhoid fever death rates in the cities of Hamburg and Zurich before and after the introduction of filters are very striking, as is noted in the following table:

COMPARISON OF ANNUAL TYPHOID FEVER DEATH RATE PER 100,000 IN EUROPEAN CITIES BEFORE AND AFTER ADOPTING MODERN FILTRATION WORKS.

	Zurich.		Hamburg.	
	Year.	Rate.	Year.	Rate.
5th year before filtration	1881	43	1888	54
4th " " "	1882	48	1889	43
3rd " " "	1883	27	1890	27
2nd " " "	1884	174	1891	24
1st " " "	1885	110	1892	34
1st year after filtration	1886	10	1893	18
2nd " " "	1887	13	1894	7
3rd " " "	1888	8	1895	11
4th " " "	1889	9	1896	6
5th " " "	1890	10	1897	7

In connection with the above data it is to be borne in mind that at Zurich the filter works completed in 1885, and which are essentially a modern plant, were not the first filters in use in that city. At an earlier date filters of a less adequate design were in service, and, like a great many other of the earlier filter works of Europe, as well as many of the present filters in America, they did not thoroughly protect the water consumers from typhoid fever.

One of the most instructive features to be learned from a study of filtration experiences in Europe is to note that very carefully prepared rules and regulations were adopted in Germany under an edict of the Imperial Board of Health, following the severe cholera epidemic at Hamburg, to insure well built and properly managed works.

It is of interest to note the records presented in the next table, in which it is shown that in typical German cities typhoid fever death rates among those people using filtered water drawn from polluted surface sources are practically the same as in those cities supplied with pure water from underground sources. These data are averages for the three years 1896-98, inclusive, and were officially prepared and offered as an exhibit at the Paris Exposition of 1900 by the Imperial Board of Health of Germany:

AVERAGE TYPHOID FEVER DEATH RATE IN GERMAN CITIES OF OVER 100,000 POPULATION FOR THE YEARS 1896, 1897, 1898, PER 100,000 INHABITANTS.

Filtered Surface Water.		*Ground Water.*	
Stuttgart	4	Munich	3.6
Chemnitz	4	Dresden	4
Berlin	4.6	Charlottenburg	4.3
Altona	6	Nuremberg	4.6
		Hanover	5.3

DEATH RATE IN GERMAN CITIES — Concluded.

Filtered Surface Water.		*Ground Water.*	
Magdeburg	6	Crefeld	6.3
Hamburg	6	Elberfeld	6.3
Bremen	6	Aix-la-Chapelle	7.3
Brunswick	8.3	Barmen	8.0
Breslau	8.6	Leipzig	8.3
Koenigsberg	17.6	Cologne	9
Stettin	20.6	Mannheim	9.3
		Cassel	10.3
		Flensburg	11.3
		Strasburg	12
		Dantzig	12.3
		Halle	13
		Essen	13.6

In America, it is to be clearly borne in mind, as already stated, that a majority (but not all) of the present filter plants are hardly built or operated in a way to yield results comparable to those which may be expected from various investigations made in this country and from practical experiences on a large scale for many years in Europe. Thus, of the sand filters at Poughkeepsie and Hudson, New York, built thirty years ago, it is well known that they suffer in severe winter weather from the lack of a cover. It is also well known that the amount of coagulant used in connection with mechanical filters, with comparatively few exceptions, is much too small to insure satisfactory results.

One of the most pressing duties among sanitarians in connection with water purification projects appears to be that they shall urge that filter works shall be not only well built but that they shall be operated with due care, comparable with that which obtains in European countries. That the members of this Association can depend upon satisfactory sanitary results following filtration by plants properly built and properly operated, is indicated not only by the European experiences above mentioned, but also by the well known experiences of a number of American cities, among which may be noted Lawrence, Albany and Lorain, as shown in the following table:

COMPARISON OF ANNUAL TYPHOID FEVER DEATH RATES PER 100,000 POPULATION IN AMERICAN CITIES BEFORE AND AFTER ADOPTING MODERN FILTRATION WORKS.

	Sand Filters.				Mechanical Filters.	
	Lawrence, Mass.		Albany, N. Y.		Lorain, O.	
	Year.	Rate.	Year.	Rate.	Year.	Rate.
5th year before filtration....	1889	127	1895	165	1892	53
4th " " "	1890	134	1896	99	1893	183
3rd " " "	1891	119	1897	86	1894	48
2nd " " "	1892	105	1898	94	1895	131
1st " " "	1893	80	1899	87	1896	83
1st year after filtration....	1894	47	1900	51	1897	24
2nd " " "	1895	31	1901	24	1898	21
3rd " " "	1896	19	1902	28	1899	26
4th " " "	1897	16	1903	..	1900	12
5th " " "	1898	14	1904	..	1901	0

Attention is called to the appendix to this report, in which mention is made of the important data being collected by the U. S. Geological Survey on matters related to water supplies.

APPENDIX.—AVAILABLE STATISTICS FROM U. S. GEOLOGICAL SURVEY REPORTS.

The attention of the committee has been called to the fact that there are in the files of the Geological Survey valuable data with reference to drainage areas of the United States and the condition of municipal water supplies there installed. The collection of these data constitutes a part of the duties of the Hydro-Economic Section, the field of which, as was explained at the last meeting of this Association, is to determine and report upon the character of the waters of this country, their availability for use in the many lines of special water development, and the damage done by municipal and industrial pollution.

Although this work of the Hydro-Economic Section is not designed to possess any direct sanitary importance, there are features, nevertheless, which may be applied to the usages of this Association. They comprise certain detailed information with reference to the pollution of water used for domestic supply, whether the source of this water be springs, wells or running streams. The reports of the engineers are to be used by the Geological Survey to determine pecuniary damages only, therefore there is presented to this committee an opportunity to extend their value by collecting from them data which can be applied to sanitary purposes and publishing the same along with the progress reports of this committee.

We believe that, while the information to be obtained from these reports has value from the standpoint of general water supply information for the use of boards of health, cities and sanitarians, it can be most effectively used by this committee to show comparative conditions; that is, having in a certain drainage area a municipality using a polluted water, we are enabled to compare it with another situated in the same area which has a supply of superior quality, and by pointing out the generally better record of the latter as against the former, we can add force to our contentions in favor of pure domestic water supplies. It is conceded that the most successful teaching has been accomplished through the use of object illustration, and the principle holds true whether our pupils are infants or college graduates, day laborers or savants. If while teaching the gospel of pure water we can hold the prize scholar up alongside of the horrible example, we will most rapidly and effectually attain our object, even though such definition of statement may violate certain local proprieties.

The work of the Geological Survey engineers has already extended to many parts of the country, and a complete investigation has been made in two important river basins, those of the Des Moines and Wabash rivers. As an example of what may be shown from the classification of these reports, the following facts have been taken from the Wabash file:

On or near the main artery of the Wabash River is an urban population of 121,597; on the principal branches, except White River, is an urban population of 78,970; while on White River, upon which is situated the city of Indianapolis, is an urban population of 296,250; making a total of about one-half million urban population along the Wabash and its several tributaries.

We find upon examination of the reports of the Geological Survey, several cities drawing water for domestic supply directly from the river or its branches; others from wells which admit considerable surface pollution; while there are still others in which the supply is of an acceptable quality, but is not in general use; and the local sources, such as dug wells, are generally maintained.

Among the cities in which the water supply is not acceptable are Anderson, Muncie, Peru and Vincennes:

STATEMENT GIVING SOURCE OF PUBLIC WATER SUPPLY OF ABOVE CITIES, THEIR POPULATIONS IN 1902, NUMBER OF TYPHOID CASES AND DEATHS THEREFROM DURING THAT YEAR, AND DEATH RATE PER HUNDRED THOUSAND FOR EACH CITY.

City.	Water source.	Population.	Typhoid cases.	Deaths.	Death rate per 200,000
Anderson	White	20,178	117	14	69.3
Muncie	"	20,942	133	24	114.6
Peru	Wabash	8,463	71	6	70.8
Vincennes	"	10,249	80	6	58.5

At Vincennes a mechanical filter has been installed, but the history of its operation shows that it does not afford constant protection, due probably to local conditions and poor management.

Among the cities using well water which is contaminated by surface drainage are Noblesville, Bluffton, Gas City and Monticello. Noblesville is situated on White River and draws its supply from wells sunk in the river bed. Its population is 479, and in the year 1902 there were 32 cases of typhoid fever, with 4 deaths, making a rate per hundred thousand of 83.4. Bluffton, Gas City and Monticello reported during the same period 11, 17 and 7 cases respectively.

Delphi is an example of a city supplied with a limited quantity of good water but dependent largely upon local sources. In the year 1902 there were 8 cases of typhoid fever and 2 deaths, making a rate of 93.6 per hundred thousand.

Further valuable information might be cited as available in the reports of the Geological Survey. They do not in all cases support the principles which we have maintained, yet by far the greater majority of evidence is corroborative and can be cited in connection with statistics showing the value of pure water supplies. Although occasionally we find a high typhoid rate with a good water supply, we have not, on the other hand, discovered an instance in these reports at least, of low typhoid rate with polluted supply.

The reports of typhoid in each of the cases above mentioned were furnished by Dr. J. N. Hurty, Secretary of the State Board of Health, of Indiana.

In closing, the committee is of the opinion that the evidence which can be drawn from hydro-economic reports of the Geological Survey is significant and can be used by this Association with profit.

REPORT OF COMMITTEE ON CANTEENS IN ARMIES.

By Dr. GEORGE M. KOBER, M. D., Chairman, Washington, D. C.

At a meeting of the American Public Health Association, held in Buffalo, September 16-20, 1901 the following resolution was adopted:

"*Resolved,* That this body deplores the action of congress in curtailing the operation of the army canteen or post exchange and in the interests of general and military sanitation recommends its establishment, on its former basis, at the earliest possible date."

Another resolution was adopted as follows:

"The executive committee recommends the appointment of a special committee to prepare and publish at an early date a pamphlet for public circulation, containing the resolution of the American Public Health Association in favor of the army canteen, together with a concise statement of the data upon which this action was based and definite references to the original sources from which such information is obtainable; such pamphlet to be issued in the name of the Association, and to be so prepared as to withstand keen and intelligent examination.

This recommendation is made in view of the fact, (1) that an important function of this Association is to educate the public in matters of hygiene; (2) that the action above referred to is in disagreement with the ideas of a very large number of good citizens; (3) that this is a possible opportunity of securing their understanding of our action, and, it is to be hoped, their intelligent co-operation in taking successive steps towards the betterment of existing conditions."

INTRODUCTION.

In order to appreciate the object of these resolutions it should be stated that the so-called canteen system was introduced as a temperance measure at Vancouver Barracks in 1880, but was not officially recognized until February 1st, 1889, as shown by the following Extracts from General Orders No. 10, Headquarters of the Army, A. G. O.

1st. Canteens may be established at military posts where there are no post traders for supplying the troops at moderate prices with such articles as may be deemed necessary for their use, entertainment and comfort; also for affording them the requisite facilities for gymnastic exercises, billiards, and other proper games. The commanding officer may set apart for the purpose of the canteen any suitable rooms that can be spared, such rooms whenever practicable to be in the same building with the library or reading rooms."

2d. The sale or use of ardent spirits in canteens is strictly prohibited, but the commanding officer is authorized to permit wines

and light beer to be sold therein by the drink on week-days and in a room used for no other purpose, whenever he is satisfied that the giving to the men the opportunity of obtaining such beverages within the post limits has the effect of preventing them from resorting for strong intoxicants to places without such limits and tends to promote temperance and discipline among them. The practice of what is known as "treating" should be discouraged under all circumstances.

3d. Gambling or playing any game for money or other thing of value is forbidden.

Subsequent order dated May 13, 1890 provides that:

"The practice of what is known as 'treating' must not be permitted."

After the abolition of post traders, these canteens became also the co-operative store and supplied the officers and men with the necessaries and luxuries which the government does not provide, such as "delicatessen," cigars, tobacco and general merchandise, articles of clothing, stationery, etc., and as such, exercised also a very important economic function.

The establishment of the canteen system in the light of the evidence which will be presented hereafter, proved to be the most efficient prophylactic measures for the diminution of vice and drunkenness among troops, and its abolition by an act of Congress approved February 2d, 1901, on purely sentimental grounds, must be deeply deplored by all interested in the prevention of physical and moral diseases. Since the question of intemperance is intimately connected with the health, morals, discipline and general efficiency of the army, it is necessary to consider the subject in all its bearings and for the purpose of approaching the question from the practical rather than the sentimental standpoint we will present a summary of the evidence:

PERSONNEL OF THE ARMY.

The recruits for the army are enlisted generally from among men of ordinary walks of life and reflect therefore the qualities of the latter whether they be good or bad.

It is not true that the soldier is peculiarly dissipated above all others and requires special legislative measures to safeguard him against his weakness, for, as justly remarked by Dr. Munson in his Theory and Practice of Military Hygiene, p. 820:

"He brings with him into the service the result of the moral moulding to which he has been subjected during his childhood and youth in civil life, and does not change his nature or moral standards with the mere donning of the uniform."

One of the members of your committee served in the army, both as an enlisted man and contract surgeon from 1867 to 1889, an-

other member served as an officer of artillery and we have therefore personal experience and observation as to the character and habits of the enlisted men, the question of intemperance, its predisposing causes and effects upon the health and morals of the troops. We are disposed to divide the rank and file of the army into four classes. The first class includes a number of young men, who have resisted the temptations of the saloons in civil life and will continue to resist the temptations after they enter the army. The second class comprises many men especially of German descent, accustomed all their lives to drink beer instead of alkaloidal beverages such as coffee and tea, who crave for companionship and the genteel amusements of a club and gymnastic hall, they regard beer as an article of food and a gentle stimulant, and life without these environments creates discontent and never reconciles them to their absence from home.

The third class is made up of intelligent mechanics and clerks, who by reason of periodical attacks of intemperate drinking habits, have lost their positions in civil life, but possessing sufficient self-respect and manhood, have entered the ranks for the purpose of securing the benefits of army discipline.

The fourth class consists of men without aim or purpose in life, and without internal resources for legitimate amusements; they are fond of morbid excitement and the alluring influences of the saloon and appear to find it difficult to check their cravings for liquor, in spite of the restraining effects of the army discipline; indeed quite a number of these men are true degenerates not infrequently drawn from the higher walks of life (gentlemen-rankers).

PREVALENCE OF ALCOHOLISM IN THE ARMY.

It is difficult to give an exact estimate of the extent of the drink habit, except by the amount of beer actually sold in the canteens, and the prevalence of alcoholism as shown by the army medical statistics. Statistics prepared by the Adjutant General of the army show that during the year 1898, the first year of the Spanish American War with its hardships, excitement and general employment of the army, the average amount spent for beer by each man in an army of 231,058 officers and men, was $2.41 per year or 48 1-5 glasses at 5 cents each, or 20 cents per month, equal to four glasses per month, for each man. The consumption in 1899 in an army of 99,160 officers and men was $6.99 or 139 4-5 glasses per year or 56 cents, or 11 3-5 glasses per month for each officer and man.

This is a very favorable showing when it is considered that the average consumption of liquor in the United States amounts to 17.68 gallons per capita.

The following table taken from Munson's Hygiene, p. 809, based upon official reports of the Surgeon General's office, shows the prevalence of alcoholism in the military forces of the army during the 28 years of peace, 1870 to 1897 inclusive:

Year.	Mean Strength.	Number of Cases Admitted to Hospital per 1000 Strength.	Number of Cases of Delerium Tremens per 1000 Strength.
1870	31,831	38.20	
1871	29,430	45.80	
1872	26,844	47.50	
1873	27,909	49.40	
1874	27,021	58.10	
1875	23,575	68.00	
1876	24,886	64.50	
1877	23.707	59.00	
1878	23,381	59.40	
1879	23,964	65.10	
1880	24,004	61.00	
1881	23,222	57.60	
1882	23,239	68.70	
1883	23,439	66.00	
1884	24,034	62.10	
1885	24,138	53.50	1.57
1886	23,572	42.80	1.01
1887	23,841	46.70	.88
1888	24,726	40.20	.92
1889	25,008	41.40	.51
1890	24,234	40.70	.86
1891	23,269	40.00	.90
1892	24,203	37.20	.78
1893	25,287	33.80	.55
1894	25,376	30.90	.82
1895	25,204	30.10	.83
1896	25,119	28.80	.39
1897	25,417	27.80	.58
1898	147,795	15.16	*
1899	105,546	18.70	*
1900	100,389	22.43	*
1901	92,491	26.25	*
1902	80,778	24.44	*

The committee has extended this investigation so as to include the five years ending December 31st, 1902 and find, as first pointed out by Munson that "during the war with Spain in 1898, the admission rate fell to 15.1; the more active operations and novelty supplying much of the desired excitement, while the unusual conditions undoubtedly attracted a superior class of young men to the colors." The

*No figures available.

same was true in 1899 when the rate for alcoholism in the bulk of our army engaged in hostilities and hard field service in the Phillipines was only about half as high as among those serving in Cuba, and one-eighth as high as among those in garrison in Porto Rico.

The rates for the United States for the year 1900 was 22.43; for 1901, 26.25; for 1902, 24.04. — In Cuba and Porto Rico the rates were for 1900, 32.01; 1901, 34.42; 1902, 48.26; in the Philippine Islands the rates were 12.16 in 1900; 21.07 in 1901; 21.10 in 1902.

From this table we learn that the rates for alcoholism in our service have steadily decreased. Since there is reason for believing that the per capita consumption of liquor in the United States has steadily increased, the decrease in the army rates for alcoholism is especially gratifying, and can only be explained by greater care exercised in the selection of recruits and in the character and preparation of food, a more rapid elimination of inebriates from the army, and last but not least the beneficial effects from the establishment of canteens.

It will be observed that the decrease is specially marked since the establishment of canteens in 1889, while the slight changes in 1901 and 1902 are not sufficiently marked to base conclusions thereon, nevertheless they indicate in connection with other evidence, an increase in alcoholism since the abolition of the canteen.

It is interesting to note that the statistics collected by Dr. Munson show that there is approximately only one-tenth as much sickness from the use of alcohol among the negro as the white troops. He says, "few colored soldiers are hard drinkers — and as far as beer and other malt liquors are concerned there apparently exists a racial distaste for these beverages on the part of the negro." Dr. Munson also adduces statistics which indicate that nationality is a factor of much importance in determining the relative amount of alcoholism. Thus for seven year periods 1890-1896 the rates of admission in our army per 1,000 of each class were as follows:

Nativity.	Admissions.
German	26.62
American born	28.51
English	51.84
Irish	90.96

These statistics appear to have also an important bearing on the influence of so-called "national beverages" on the drink habit, and their effects upon the system. The German and American born soldiers generally prefer beer while the English and Irish are accustomed to stronger drink like ale and whiskey.

THE CANTEEN AS A PROPHYLACTIC MEASURE.

In order to appreciate the beneficent effects of the canteen system not only in the reduction of the drink habit, but also as a powerful moral factor in the life of the soldier, it should be remembered that, prior to the inauguration of the canteen or post exchange, the so-called sutler's or post trader's store was allowed by army regulations. The proprietor was a civilian appointed by the Secretary of War, and at a subsequent period these appointments were made upon the recommendation of the members of the post council. These stores furnished merchandise and luxuries not supplied by the commissary department, and were also an accommodation to the pioneer settlers. One of the most profitable articles of sale were whiskies, brandies, wines, cigars and bottled beer. These were sold usually across the counter and very few of the sutler stores provided the facilities of club life, such as billiards, reading rooms or games and if so, the charges were exorbitant, and gambling for money was not infrequent. Most generally they presented all the characteristics of the American bar, drinks being consumed in rapid succession, aided by the pernicious system of "treating."

It is quite true these establishments were subject to military orders and the sales of liquor could easily be controlled, but whenever and wherever the attempt was made on the part of the commanding officer to regulate the character and amount of drinks to be sold, it was promptly frustrated by the establishment outside of the post reservation of little shacks or shanties for the sale of vile whiskey; these were gradually enlarged by the addition of rooms for gambling and the introduction of lewd women of the lowest class and as a result in addition to the excesses of alcoholic stimulants, the effects of an immoral life and its far reaching consequences were stamped upon those unable to resist the temptations and a result, trials for drunkenness, absence without leave, admissions for alcoholism and venereal diseases increased with startling rapidity. One of the members of your committee recalls that on more than one occasion, in order to avert complete demoralization of the men, the commanding officer felt constrained to rescind his orders prohibiting the sale of alcoholics for he realized that the post trader could be compelled to sell a pure article of whiskey and thus diminish the baneful effects of alcoholic stimulants to a minimum.

At posts situated within the heart of an Indian country, and where it was impracticable to establish grog-shops within a reasonable disance from the post, whiskey was brought into the garrison through the mails in various disguises, or in express packages and peddled in

two ounce vials by soldiers themselves. Others resorted to the purchase of essence of ginger, lemon, vanilla, bayrum, alcohol, and patent or proprietary remedies containing alcohol in various percentages.

Hence even the most favorable environment failed to prohibit. It was not until the establishment of the canteen system, that better conditions were offered for the promotion of temperance among our soldiers. It was the creation of the soldiers' club which reduced the drinking to a minimum, and promoted not only temperance and contentment, but also lessened sickness, immorality and crime.

TRIAL BY COURTMARTIAL FOR DRUNKENNESS, ETC.

The statistics already presented conclusively show that coincident with the general establishment of the canteen system throughout the army, there has occurred a decrease amounting to considerably more than one-half the drunkenness which formerly tended to the impairment of discipline, the demoralization of individuals and to the occurrence of assaults, injuries and deaths.

The following statistics prepared by Dr. Munson and extended by the committee show a gradual improvement in the tone and morale of the army, as evidenced by the number of court martials. This improvement is especially marked since the establishment of the canteen.

The average of trials and convictions for drunkenness and conditions arising therefrom for from 1886 to 1891 was 372.5 against an average of 160.0 for the six years after the establishment of the canteen.

Year.	Total Number of Trials and Convictions in the Army. All Causes.	Number of Trials and Convictions for Drunkenness and Conditions arising therefrom.
1886	1,640	342
1887	1,730	289
1888	1,999	357
1889	1,752	423
1890	1,907	407
1891	2,000	417
1892	2,198	228
1893	2,189	163
1894	1,728	120
1895	1,486	142
1896	1,384	168
1897	1,245	143
1898	1,865	313
1899	5,694	1,386
1900	6,618	1,837
1901	6,065	1,458
1902	5,311	1,000

The statistics from 1898 to 1902 should be excluded as they cover the period of the Spanish American War, when a large number of volunteers were enrolled. In this connection attention is directed to the reports of commanding officers on file in the War Department, and published in House of Representatives' Document No. 252, 57th Congress, 2d Session. Brig. General Frederick Funston, U. S. Army, Commanding General Dept. of Colorado, reports p. 22, the number of trials by general court-martial for 1902 to have been 194, and as compared with the preceding year, the percentage of average enlisted strength to have nearly doubled. He also gives the per cent of average enlisted strength deserting in his Department as follows:

1899-1900	3.20
1900-1901	7.50
1901-1902	11.00

He writes as follows:

"It is therefore plain that there has been a deplorable increase of offenses in general and of desertion in particular. In my opinion there are two principal causes for this state of affairs. First: resentment to unaccustomed limitations and restrictions felt by men returning from field service to the monotony and routine work of garrison life; second, the abolition of the canteen feature of the post exchange. Since this action was taken saloons of the lowest type have been established just outside the boundaries of the various reservations; their proprietors are, in almost every case, unprincipled scoundrels, who leave nothing undone to debauch the soldiers and obtain their money. Being, in all cases, outside the limits of any city, the proprietors of these resorts are subject to no municipal police regulations and sell liquor regardless of hours and whether the buyer is already intoxicated or not. Gambling is universal in these 'dives,' and they are frequented by dissolute women. The soldier whose desire for a drink would ordinarily be satisfied by a few glasses of beer in the canteen of the post exchange goes to one of these resorts and does well if he escapes before he has spent or gambled away all his money, overstayed his leave or engaged in an altercation. As a rule, the local authorities regard the existence of these places with indifference or approval, as it causes the soldier to spend his money in the community. The efficiency of the army or the ruin of a good soldier is nothing to them. There can be no reasonable doubt that most of the trials by general courts-martial and summary courts, at least so far as this department is concerned, are directly traceable to this cause. Since I have had command here there has taken place the ruin and degradation of several non-commissioned officers of long service and fine record. In short, the recent legislation of Congress on this question, so far as this department is concerned, has had no effect except to lower the discipline of the Army, ruin scores of good soldiers, and fill the pockets of a lot of saloon keepers, gamblers, and prostitutes."

DESERTIONS.

The following table compiled from the records of the War Department, shows what the establishment of the canteen has accomplished in the promotion of virtue and loyalty to the flag. This table demonstrates that for the ten years previous to the establishment of the canteen the number of men annually deserting from the service amounted to 125 per 1,000 strength, while for the ten subsequent years the annual number of desertions was reduced to 46.2 per 1,000 strength.

It is to be deplored, that this favorable record which continued for ten years after the canteen system was thoroughly established, should be broken by a rate of 73 per 1,000 the year following the abandonment of this system. These figures are extremely suggestive, because the best index of the contentment and virtue of troops, is to be found in the rate of desertions and trials by courts-martial.

Table showing percentage of desertions in the army of the United States; from 1880 to 1900, and 1901-2.

Year.	Strength.	Per. entage
1880	24,601	9.
1881	23,572	12.5
1882	23,743	16.4
1883	23,814	15.2
1884	24,706	13.6
1885	24,816	10.6
1886	24,365	8.3
1887	24,438	10.
1888	24,790	11.
1889	25,564	11.
1890	24,930	7.7
		12.50
1891	24,525	5.7
1892	24,867	5.7
1893	25,670	6.3
1894	25,661	3.6
1895	25,200	5.3
1896	25,143	3.4
1897	25,304	2.9
1898	44,397	4.
1899	62,019	4.9
1900	66,400	4.4
		4.62
1901	75,431	4.12
1902	82,472	7.30
		5.71

SAVINGS DEPOSITS.

Dr. Munson on p. 819 of his Military Hygiene also refers to the increased savings-deposits with army paymasters as one of the beneficent effects of the canteen system in the promotion of order and contentment. At all events the figures reported by the Paymaster General in his report for 1899 show, that the average number of men annually making such deposits for the seven years 1885-91 was 7.273, while for the six years 1892-97 the annual average so deposited was 8.382 an increase of 13.3 per cent. This indicates not only increased contentment but a decided improved moral tone and means that over 1,100 additional depositors were created thus practically giving bond to the government for good behavior.

Statement showing the number of enlisted men, the amount of soldiers' deposits, and the average deposit per man, for four fiscal years from 1900 to 1903 inclusive.

Year.	Troops.	Deposits.	Average per Man.
1900	64,969	$3,215,544.66	$49.49
1901	65,000	3,448,529.11	53.05
1902	70,711	2,660,250.66	37.62
1903	59,866	1,888,014.87	31.54

VENEREAL DISEASES.

Another remarkable victory achieved by the canteen system over vice and disease is shown by the decrease in the prevalence of venereal disease in the United States army. This reduction was gradual and constant until the abolition of the canteen system when again a most marked and lamentable increase is noted, the admission rate for syphilis, chancroid and gonorrhea, in 1902 having almost doubled when compared with the rate for the decade 1890-1899 and the predictions of the Hon. Secretary of War, Mr. Elihu Root and the Rt. Rev. Archbishop Ireland, have, alas, been fulfilled. Mr. Root in his testimony before the Senate Committee on Military Affairs, December 14th, 1900, said:

"It is that in the vile resorts which cluster against the borders of every army post there is not only the liquor seller, with his bad whiskey but there is the prostitute. The man who goes to the ginmill for his recreation falls into the hands of that woman and he comes back not merely to the guard house for drunkenness or for over-staying his time, but to go into the hospital with venereal disease."

"These misguided people are doing a Satan's work in endeavoring to take these fellows out from under the restraint and under the influences that surround them when they are in camp and drive them

out into the horrible and demoralizing and damning surroundings that cluster around the outside of the camps."

Before the same Committee Archbishop Ireland declared:

"One thing is overlooked by many people who discuss the canteen question. It is this matter of prostitution which is of course fatal to the soldier, soul and body. They only look at the mere drinking, but when a soldier goes outside to drink, outside the fort or reservation, he is generally tempted to go farther. That is the danger * * * You will find soldiers arrested in houses of prostitution; are arrested and we ask, 'How did you get there?' The explanation is that they went outside and got drunk in some of these vile saloons and they were induced to go to these houses from the saloons. The agents of these houses are there, and they are there particularly for the purpose of inveigling the soldiers into these houses. The houses that I refer to are on the borders of the fort and are houses of prostitution — all of them."

VENEREAL DISEASES IN U. S. ARMY.

Syphilis.

Year.	Admission to Hospital per 1000 Strength.	Year.	Admission to Hospital per 1000 Strength.
1880	49.4	1891	14.7
1881	47.6	1892	16.0
1882	40.1	1893	13.6
1883	35.6	1894	14.1
1884	29.8	1895	11.1
1885	24.8	1896	10.9
1886	22.5	1897	12.0
1887	22.9	1898	10.0
1888	22.2	1899	14.7
1889	22.0	1900	18.4
1890	19.7		

	1898	1899	1900	1901	1902	1890-1899
Syphilis ..	10.08	14.97	18.46	20.38	22.37	12.67
Chancroid	....	38.29	46.44	37.18	31.99	17.88
Gonorrhœa	46.42	93.18	93.68	99.25	106.58	55.60

INSANITY.

For the sake of completeness we submit a table showing the rates for mental diseases in our army for the period from 1880 to 1902 inclusive.

It will be observed that there was a decided tendency to diminution of insanity from 1884 to the beginning of the Spanish American War, probably the result of better provision for the intellectual needs and recreation of the soldier, and of which the canteen system may have been a factor. It would be unfair however to attribute the increase in recent years to the absence of canteens, since service in tropical

islands, the lack of knowledge of the native languages and enforced confinement to garrisoned towns, together with the constant strain incident to continued preparation against attack by the enemy, all combine to act as predisposing causes to different forms of mental diseases, which are by no means limited to the drinking classes.

INSANITY U. S. ARMY.

Year.	Cases.	Mean Strength.	Admission Rate per 1000 Strength.
1880	50	24,002	2.1
1881	62	23,222	2.5
1882	65	23,239	2.8
1883	71	23,439	3.0
1884	52	24,034	2.1
1885	34	24,138	1.4
1886	33	23,572	1.4
1887	46	23,841	1.9
1888	42	24,726	1.7
1889	34	25,008	1.3
1890	33	24,234	1.3
1891	37	23,269	1.5
1892	48	24,203	1.9
1893	35	25,287	1.3
1894	24	25,376	.9
1895	21	25,204	.7
1896	22	25,119	.8
1897	21	25,417	.8
1898	159	147,795	1.1
1899	188	105,546	1.8
1900	273	100,389	2.7
1901	166	92,491	1.8
1902	138	80,778	1.7

PRESENT ASPECT OF THE QUESTION AND THE EFFECT OF THE SALE OF BEER AND LIGHT WINES AT MILITARY POSTS IN THE UNITED STATES.

The provisions of the act approved February 2d, 1901, prohibiting the sale of or dealing in beer, wine or any intoxicating liquors in post exchanges was promulgated in General Orders No. 5, dated February 2d, 1901 — so that now over two years have elapsed during which the effects of this law upon the health and morale of the army can be studied. In transmitting a copy of this order the Secretary of War enjoined upon all department commanders a prompt and effective compliance with the terms of the act, and requested that he might be informed of the effect of this law on the morality, health and discipline of the troops, commanding officers be instructed along the following lines, report thereon to be made to the Adjutant General not later than September 1, 1901:

1. To prepare at once a list of the liquor saloons within one mile of their reservation limits; to observe and record any additional saloons subsequently established within such limits.

2. Special mention to be made of saloons temporarily opened in the vicinity of posts or camps where the new regiments are to rendezvous or regiments returning from the Philippine Islands are to be mustered out.

3. To observe whether drunkenness among the enlisted men of their commands increases or decreases as a consequence of the abolishment of the canteen; whether the percentage of trials by summary or other courts for drunkenness for the coming six months is greater or less than for the past six months.

4. To make similar observations as to desertion and absence without leave.

5. To observe generally the effect of the abolition of the sale of beer at the post or camp on the morality and discipline of the command.

6. To make similar observation as to its effect upon the health of the command.

7. To report the effect of the law upon the table fare of the soldier in garrison and in the field, and to recommend measures for any improvements therein that may be considered necessary.

Replies have been received at the War Department, which indicate the following conditions:

1. INCREASE OF LIQUOR SALOONS WITHIN ONE MILE OF MILITARY POSTS SINCE THE PASSAGE OF THE ACT.

The reports under this head show that on or about February 2d, 1901, the date of the passage of the act abolishing the sale of beer, there were within one mile of the military posts, 1,555 saloons at which intoxicating liquors of all kinds were dispensed, and at the date of the last report there were 2,267 such saloons; that is to say that 98 post canteens at which beer and light wines alone were sold, had been closed and their places taken by 341 saloons in the United States and 371 saloons in the Philippine Islands, dispensing all kinds of intoxicants, in very many cases with gambling rooms attached and in at least three instances houses of ill fame. Many of the additional saloons have been opened by discharged soldiers.

2. INCREASE OF DRUNKENNESS.

To the inquiry to report whether drunkenness among the enlisted men of their commands had increased as a consequence of the abolition of the canteen 98 post commanders replied of which number 81 reported that drunkenness had increased, 10 that it had decreased

and in 7 cases the commanding officers had no means of comparison owing to changes of garrison or absence of data relating to prior garrisons, new posts established since February 2, 1901, and the failure to report of the specific question, or inability to reach a positive determination from the language of the report. For increase in alcoholism in the army consult page 104 of this report.

3. INCREASE OF TRIALS BY SUMMARY OR OTHER COURTS FOR DRUNKENNESS AND FOR OFFENSES CAUSED BY DRUNKENNESS.

To this inquiry 98 post commanders responded, of which number, 69 replied that such trials had been more numerous since the passage of the bill, 8 that they had been less, and in 21 instances the effects were in doubt, for reasons given under paragraph 2.

4. INCREASE OF DESERTIONS.

To the inquiry whether desertion had increased or lessened, 98 post commanders replied, of which number 54 reported that desertion had increased, 8 that it had decreased, and in 36 reports the result was in doubt for reasons stated under paragraph 2. For statistics see page 106 of this report.

5. INCREASE IN ABSENCE WITHOUT LEAVE.

To a similar inquiry as to absence without leave, 98 post commanders replied, of which number 74 reported that absences without leave had increased, 6 that they had decreased and in 18 the effect was doubtful for reasons stated in paragraph 2.

A number of post commanders reported that absences without leave had doubled and in some cases they had increased from 250 to 300 per cent.

6. EFFECTS OF THE ABOLITION OF THE SALE OF BEER AT THE POSTS ON THE MORALITY AND DISCIPLINE OF THE COMMAND.

To this inquiry post commanders replied; one reported that the effect had been good, 56 that it had been bad, and in 42 instances the commanding officers had no means of comparison owing to changes of garrison, or absence of data relating to prior garrisons, etc.

For statistics of venereal diseases see page 108 of this report.

November 28, 1902.

Adjutant General, U. S. A., Washington, D. C.

SIR: — As the restoration of the canteen to the posts of the army has been very generally recommended to the Secretary of War and by

him in his report to Congress, the following may not be without interest:

The claim of the War Department in recommending the restoration of the canteen to the army in order to control the liquor traffic at military posts, that during the operation of the canteen law the discipline of the army was superior, desertions much less and in consequence of the morale of the army there were fewer fines and forfeitures by courts martial on account of breaches of military discipline resulting from the abuse of intoxicants by men in the service, appears to be fully borne out by the records of the P. M. G. O.

The records show that the paymasters of the army collected from about 75,000 enlisted men (regulars) during the last year in which the canteen was in force, on account of soldiers' home dues,* fines and forfeitures, the sum of $462,698.78, while during the fiscal year 1902, since the abolishment of the canteen, there was collected by paymasters from about 70,000 enlisted men (regulars) on account of soldiers' home dues, fines and forfeitures, the sum of $632,125.60, thus showing that during the first year subsequent to the abolishment of the canteen, there was $169,426.82 more collected from enlisted men than during the last year of the operation of the canteen with more men in the service.

The fact, therefore, appears undisputable by the figures cited that the fines and forfeitures imposed upon and collected from the enlisted men of the army were vastly increased during the year subsequent to the abolishment of the canteen, which increase cannot be well attributed to any other cause than the effects of an uncontrolled liquor traffic in connection with military posts, which traffic appears to seriously affect the discipline and morale of the army.

Very respectfully,

A. E. BATES,
Paymaster General, U. S. A.

COLLECTIONS MADE BY PAYMASTERS.

Year Ending.	Number Enlisted Men.	Fines and Forfeitures.	Average per Man.
June 30, 1898.....	28,110	$52,905.88	*$1.88
June 30, 1899.....	66,258	166,207.87	
June 30, 1900.....	69,669	316,943.83	
June 30, 1901.....	81,287	340,768.28	
June 30, 1902.....	70,711	526,059.10	
June 30, 1903.....	62,866	428,731.38	*$6.82

CONCLUSIONS.

A careful review of the evidence on file in the various bureaus of the War Department justify the following conclusions:

1. The abolition of the post canteen, more especially the prohibition of the sale of light wines and beer, instead of proving a tem-

*"The soldiers' home dues" are fixed by law, every enlisted man has to pay 12½ cents per month towards the support of the U. S. Soldiers' Home in Washington.

†Average per man.

perance measure as hoped for by its advocates, has had a detrimental effect on the health and morale of the troops. In the opinion of an overwhelming majority of commanding officers, drunkenness has actually increased and the admission rate for alcoholism has been increased from 22.43 per 1,000 in 1900 to 24.02 in 1902. The 98 post canteens at which light wines and beer alone were sold have been replaced within one mile from military posts, by 341 additional saloons in the United States, and 371 in the Philippine Islands dispensing all kinds of intoxicants in many cases with gambling rooms and in some cases with houses of ill fame attached.

2. Since drunkenness and vice are intimately associated, it is natural that the evidence should reveal an alarming increase in the prevalence of venereal diseases in the army. As a matter of fact the statistics of the Surgeon General's Office show that the admission rate for these diseases in 1902 is almost twice as high, than for the decade of 1890-1899, and is doubtless the result of the causes pointed out by Secretary Root and Archbishop Ireland. In view of the grave and far-reaching consequences of these diseases which are a menace to the public health and welfare, and so often transmitted to the innocent and to future generations, this result, apparently associated with the abolition of the canteen is especially deplorable.

3. It is a matter of evidence that desertions, absences without leave, and trials of summary or other court martial for drunkenness and for offenses caused by the same have increased, and that savings deposits by the enlisted men have decreased from an average of $49.49 per man in 1900 to an average of $31.54 per man in 1903. The records of the Paymaster General's office also show that the fines and forfeitures imposed upon and collected from the enlisted men of the army have increased from an average of $1.88 per man in 1898 to $6.82 per man in 1903, all of which indicates a growing spirit of discontent, and a decided tendency to degeneracy, which must seriously affect the discipline and morale of the army.

RECOMMENDATIONS.

In view of the foregoing facts and in the interest of scientific temperance, the committee recommends:

1. The presentation to the Senate and the House of Representatives in Congress assembled, of the following resolution adopted by the American Public Health Association in September, 1901.

"*Resolved,* That this body deplores the action of Congress in curtailing the operation of the army canteen or post exchange and in

the interest of general and military sanitation recommends its establishment on its former basis, at the earliest possible date."

Resolved, That this body in the interest of temperance and humanity cordially invites the intelligent co-operation of a very large element of good citizens, who have been active in securing legislation against the sale in the military service of alcoholics of any character, in taking successive steps towards the betterment of existing conditions and thus assist in controlling and largely curtailing an evil which it is powerless at present to prevent.

2. Your committee is aware of the fact, that beverages containing alcohol are an accessory food of value only when it becomes necessary to increase temporarily the elasticity of mind and body and a desire and capacity for work, and that the subsequent depressing effects and the baneful influence of its misuse, requires great care in its employment, especially when rest, proper food and some of the alkaloidal beverages like coffee, tea, cocoa, and stimulants like meat-broths and soups may accomplish the same purpose, and their sale as a substitute should be encouraged.

3. In spite of the fact that "beer-drinking viewed in the abstract is unproductive of good, your committee believes, that its sale in canteens under rational and comprehensive regulations, rather than its total prohibition, will subserve the best interests of scientific temperance, because so long as human nature is weak and the masses are not properly educated, the substitution of a lesser evil under military control, appears not only justifiable but will in the future, as it has in the past, prevent excesses which are fatal to the soldier, soul and body. At present every effort towards total abstinence at military posts, merely opposes theory to facts, and sentiment to statistics, and compels recourse to saloons of the lowest character, whose proprietors care nothing for the efficiency of the army or the ruin of a good soldier.

4. Every precaution should be observed to conduct post exchanges and the sale of light wine and beer along the lines recommended by Munson in his Theory and Practice of Military Hygiene, pp. 820-822, and your committee begs to emphasize the fact that the far feature should be entirely abolished, and that the exchange should in fact be a soldiers' club, with ample facilities for reading rooms, legitimate amusements and athletic sports, where the soldier as a self-respecting individual may satisfy in an orderly manner his craving for diversion from the routine duties of a military life, wthout undue prominence of the refreshment feature.

5. The sale of soft drinks, coffee, tea, cocoa, bullion, soups and warm lunches should be encouraged as substitutes for alcoholic bev-

erages, and medical and line officers should be directed to educate by precept and example the rank and file of the army, that for persons in health alcohol in any form presents no advantages not found in other food stuffs or stimulants and which are moreover free from the dangers attending its use. In this connection it should be remembered that good food, well prepared, and properly cooked and served, is one of the most effective, prophylactic measures against the "drink habit" in civil as well as military life, and no effort should be spared to bring the culinary department in the army to the highest state of perfection. Medical officers should point out the grave and far reaching consequences of the effects of venereal diseases, so intimately connected with the drink habit, and make a strong plea in favor of continence. This may be done by telling these young men, that while the sexual passion is very strong it can be accelerated or delayed, excited or lowered by the influence of the will. The soldier can be assured that by the cultivation of pure thoughts, removal of temptation, normal, mental, and especially by vigorous physical exercise continence is not only possible, but easy.

7. A strong effort should be made to improve the social conditions of the soldier. There are times and occasions when the friendly advice of a company commander or attending surgeon, a personal interest in the physical and moral welfare of the young soldier, will prove of greater benefit to the service and to humanity, than the cold verdict of a summary court martial. Such personal efforts on the part of the officers, dictated by the spirit of a universal brotherhood of man, appears to us perfectly compatible with proper military discipline. It is also believed that the habit of making savings deposits with the army paymasters may be greatly stimulated by personal efforts.

In conclusion the committee desires to express its obligations to the officials of the War Department for the opportunity of making a full and impartial investigation of the records, and especially to Dr. Edward L. Munson, U. S. Army, the author of "Military Hygiene" for invaluable assistance in the preparation of this report.

APPENDIX.

EXTRACTS FROM REPORTS OF POST COMMANDERS.

Comanding Officer, Fort Caswell, N. C.:

* * * I do not think the morality or discipline of the command has been much affected by the abolition of the canteen. I notice though, that fewer men are willing to re-enlist for organizations at the post and I believe some discontent has been caused by this law.

Commanding Officer, Fort Snelling, Minn.:

* * * From my own observation and that of the officers of the garrison, the morality and discipline of the post was superior after the abolishment of the canteen as compared with any period prior to that act. * * * The percentage of sick was much less after the abolishment of the canteen. * * * The records show that the number of desertions for the six months prior to the abolishment of the canteen exceeds that of the six subsequent months. * * * On February 1, 1901, there were two saloons within one mile of the reservation. Up to the time of my leaving Fort Snelling, September 1, 1901, no additional saloons had been established. * * * I find that the company amusement room with tobacco, cigars, lunch and soft drinks on sale is more satisfactory than a common amusement room, as at a large post a common amusement room of sufficient size to accommodate the whole command when off duty cannot well be established; besides, the company amusement room develops and fosters the company unit which constitutes the most important factor in contentment and discipline. I urge the early establishment by the quartermaster's department at every large post of a well equipped gymnasium in connection with a race track and athletic grounds. * * *

Commanding Officer, Fort Logan, Colorado:

I believe that many company commanders are induced to approve of the canteen feature of the post exchange because they obtain an income from it with which they improve the mess of the men and purchase pool tables, gymnastic outfits, bowling alleys, etc. It must be remembered the soldiers of our present army are much younger than before the Spanish War. They are men who either do not drink or who drink very little and have not contracted the drink habit. It is the duty of the government to protect these men and not put temptation before them. * * * It is not sufficient to say to a soldier "you shall not drink" but surround him with wholesome and decent means of diversion and amusement and he will not want to drink."

EFFECTS IN PROHIBITION STATES WHERE THE SALE IS REGULATED BY THE STATE.

Commanding Officer, Fort Fremont, S. C.:

* * * * The number of cases of venereal disease in the command has increased. The evil effects of the law in question upon the health of the command have been more marked. The places at which liquor is sold are frequented by negro women of loose character, with whom the men are thus more closely associated than was formerly the case. * * * * The liquor sold in the vicinity of the post is of the poorest quality and is from what I can learn, adulterated very often with the most injurious substances. During the summer just past three members of the command have died under exactly the same conditions, each exhibiting the same symptoms, and each dying within six hours after having been first taken ill. In each case the man had absented himself for the twenty-four hours preceding his illness and had during that time been drinking heavily of the liquor sold

around the post. The diagnosis of the surgeon in each case was "Cerebral congestion due to excessive use of alcoholic stimulants," It is very difficult in this state to secure the conviction of a man charged with selling liquor illegally and until recently it has not been practicable to obtain sufficient evidence to justify the prosecution of any of these persons so engaged. Recently, however, enough evidence to secure the conviction of one of the proprietors of these places has been obtained and he will be prosecuted at the next meeting in this county of the criminal court.

Commanding Officer, Sullivan's Island, S. C.:

The stoppage of the sale of beer induces patronage of state dispensaries where liquor is sold by bottle only and consequently large quantities are drunk at one time.

Commanding Officer, Fort Riley, Kan.

* * On February 13, 1901, there were eleven joints and eight drug stores within one mile of the Reservation limits. On August 21, 1901, six joints and eight drug stores. The drug stores in Junction City sell liquor, spirits and beer, and the joints are simply bar rooms. Kansas is a prohibition state.

Commanding Officer, Fort Ethan Allen, Va.:

Vermont is a Prohibition State. * * * While there are no liquor saloons there are many drug stores. All sell liquor on prescription. Prescriptions are easily obtained.

Commanding Officer, Fort Logan H. Roots, Arkansas:

* * * There are men in the ranks of our army from many walks of this life, and many of the most valuable clerks, mechanics, carpenters, etc., are men of good education and trades, who are in the army because periodical sprees have lost for them many positions in civil life, and they entered the army to receive the discipline it affords. Take their daily drinks from them, tell them that they shall not drink, and you make drunkards of them. * * *

Commanding Officer, Fort Apache, Ariz.:

* * * In my opinion the breaking up of the canteen system has been the hardest blow we have received in many years. Before its abolition our men were well satisfied with their condition, they had good food, the receipts from the canteen were applied in various ways for their welfare, comfort and amusement, and they were rarely drunk and seldom absent. Now at many posts it is the reverse. Places known as "hog ranches" are established near the posts, if not, then men called "boot-leggers" are selling whiskey to the men by the bottle; (many of the men would not think of patronizing the whiskey peddlers if they could occasionally get a glass of beer at the post); after one or two drinks of the vile stuff that is sold them, they do not or cannot know what they do, remaining away from the post for a day or two; some fearing punishment on their return to the post, desert; the idea that full grown men are going to patronize a canteen where nothing is sold except soft drinks, is an illusion.

Commanding Officer, 27th Regt., N. Y. Volunteers:

Reports from Presidio, San Francisco, Cal., as follows:

* * * My camp was located just inside the main gate of the reservation. Across the street and in the immediate vicinity were located many saloons which were most of the time crowded by soldiers. The saloons were there expressly to catch soldiers and were successful. Drunkenness and disorders were very frequent. From my observation, while serving with the volunteers in the Phillipines, I consider the abolishment of the sale of beer in the post canteen a positive calamity to troops serving in that locality. Men will drink stimulants if they wish to and there is always a supply where there is a demand. In the Phillipines, drinking men are almost sure to resort to the native drink "vino" if unable to obtain beer. The poorest whiskey ever distilled cannot compare with "vino" in its evil effects upon men. The latter drink seems to destroy the character of a man, mentally, morally and physically. I believe many deaths and much of the insanity which occurred during my stay in the islands were due either directly or indirectly to the use of "vino."

Commanding Officer, Presidio of San Francisco, Cal.:

* * * Volunteers returning from the Phillipines have made raids upon nearby saloons, being incited to such deeds under drunken or perhaps sometimes sober impulses aroused by real and imaginary grievances, such as being drugged, robbed or otherwise maltreated while in the saloons. There were several such occurrences between January 1, and July 1, 1901, which were so serious that it became necessary for the commanding officer to aid the police in restoring order and to save property from destruction. * * *

Commanding Officer, Mayayguez, Porto Rico:

* * * The percentage of sick in this last company has been over ten per cent the last three months. I believe it is due to rum drinking instead of beer. Every effort has been made to discover the cause of the sickness in this company and no other cause than that some of the men were financially backing a rum shop near the post has so far been discovered.* * *

Commanding Officer, Ponce, Porto Rico:

The effect of the abolition of the sale of beer is very bad, both morally and for discipline, because the men will have beer and must go into the city to get it. There they are thrown into contact with immoral women and drink rum and other cheap alcoholic beverages. These drinks cause some men to become crazy and boisterously drunk. Before the abolishment of the canteen most of the beer drinkers drank almost exclusively in the exchange and in moderation.

Post Surgeon, Fort Schuyler, N. Y.:

* * * Where two affections, such as excessive drinking and venereal diseases are so intimately associated, were it possible to control the former, the latter would of itself greatly decrease. While it is true many cases of venereal diseases may occur where drinking has not been a factor, still by far the majority of cases reported to me have been subsequent to drunkenness and resulting carelessness."

Commanding Officer, Fort Douglas, Utah:

* * * The social evil in this city is more rampant than I have ever seen before. When we had the canteen the men were contented to stay in the post, but now they want to go to town all the time and these women get hold of them.

Commanding Officer, Benicia Barracks, California:

"A post is the soldiers' *home* during the time he is in the army, and a well managed, regulated and attractive canteen, where beer and light wines are sold, adds to the physical, moral and intellectual well being of a soldier, improves his surroundings, contributes to his rational enjoyment and adds to his pleasures, making him a contented and satisfied soldier. To make a post a mere place where duty is the sole thing and every diversion and recreation denied a man, makes duty dull, uninteresting and stupid. That there should be a canteen at every post, in my opinion admits of no argument.

Commanding Officer, Camp McKinley, H. T.:

* * * The effect of the abolition of the sale of beer has been to double the number of trials for drunkenness and also for absences without leave.

Commanding Officer, Washington Barracks, D. C.:

* * * With the canteen in existence the decent, well behaved, self-respecting and orderly men of the command — men who pride themselves on their soldierly conduct and good behavior — had the privilege of drinking an occasional glass of beer in an orderly, clean and perfectly proper establishment for that purpose. They enjoyed the privilege and respected it and were well satisfied with their condition and surroundings, knowing that they were being treated as self-respecting men, free to indulge a perfectly proper and legitimate appetite in a perfectly proper way and knowing also that they were being benefited indirectly in their better food provided upon their mess table. * * * The moment the sale of beer was abolished the human nature of every individual man, good, bad, indifferent, at once resented this interference with his individual right to regulate his appetite and to try and force him to be a total abstainer from the use of alcoholic drinks. The effect was to at once make every man assert himself to indulge intemperately in the use of beer or something stronger; to at once seek outside of the post that which he was denied therein and to be dissatisfied restless and discontended and to show this spirit on any and every occasion possible. * * * The demand for all night passes became so overwhelming that positive and stringent regulations had to be adopted to regulate the number. * * * With the abolition of the sale of beer the soldier's club practically ceased and their only recourse for diversion and recreation was to go to the saloon dives and brothels of the city of Washington, with their very decided immoral adjuncts.

The hospital records show that during the period August 2, 1900, to February 2, 1901, there were admitted to sick report 13 venereal cases and three cases of alcoholism, while for the period February 2, 1901, to August 2, 1901, there were admitted 31 cases of venereal dis-

eases and seven of alcoholism. * * * The total abstainers may claim what they please as to the abolition of the sale of beer in the navy. It is respectfully submitted that the cases are not parallel in any particular. * * * To try and regulate a military garrison by the same rules possible on board a ship at sea, would be to confine every man of the command — officers and all, to the limits of the post for weeks and months at a time, — evidently not only impossible but also very undesirable, yet the only way to enforce total abstinence.

Commanding Officer, District of Santiago, February 1, 1902:

The recent act of Congress prohibiting the sale of beer and light wines at all military posts has been the means of breaking up to a certain extent the happy club life of the soldier. It is a well established fact that there has been more drunkenness among the soldiers at army posts since abolition of the canteen than there was before. No system of discipline or severity of punishment can prevent soldiers from visiting low saloons and obtaining liquor. The canteen question resolves itself into one of expediency rather than sentiment. If it can be proven that temperance in the army is best promoted by a well regulated canteen under the immediate eye of the commanding officer, the practical view of the matter will ultimately prevail instead of an abstract theory. It has been advanced by some who are severe and unreasonable in their condemnation of the canteen that all soldiers who are inclined to drink intoxicating drinks should be put out of the army. This is absurd. It is folly to talk of an army of total abstainers; nor is it to be expected that men enlisting as soldiers to serve their country shall be forced to take a temperance pledge any more than that they should be forced to be religious. Soldiers are not children to be governed like children. They are men upon whom the country must depend for a stalwart individuality and the exercise of heroic qualities in the stress of privation, hardship and danger. If they are to be trusted in battle, they must be trusted in garrison. In the interest of discipline, morality, general welfare and contentment of the soldier of the army, I most earnestly recommend that the act of Congress prohibiting the sale of beer at army posts may be repealed by Congress at the next session.

EXTRACT FROM A PETITION FROM ENLISTED MEN TO THE SENATE COMMITTEE.

In submitting this petition we desire to express to your honorable committee and through you to the Senate of the United States and through the Senate to the people of the United States, our reasons for petitioning for the defeat of this amendment which in our opinion (and we are confident our opinion is that of 87 per cent of the enlisted strength of the army) deprives the American soldier of not only his chief source of pleasure and recreation in his life as a soldier, but also the safeguards against temptation which are thrown in his way when he is forced outside of the garrison for recreation and amusement; for its passage means abolition of the post exchange.

The post exchange as conducted in the army to-day is a mutual co-öperative institution in which every enlisted man in the garrison is practically a stock holder, as it is run solely for his benefit. Its object is two fold, 1st, to afford the soldier a place where he can obtain at the minimum cost to himself and where any profit made will redound to his benefit, those recreations which all religious denominations of the country deem of sufficient importance to the working men and women of this country to take under their fostering care irrespective of denomination, i. e., the establishment of working men and working women clubs to employ the unoccupied time of the members, with the addition that beer and soft drinks are sold; the profit from which, as the government does not make any appropriation for the support of the same, * * * enables the post exchange to be run and furnishes the means for its secondary object, and that is to provide the soldier with those articles of food, which are commonly called luxuries and which although the American soldier is acknowledged by every reading man in the United States, to be the best clothed and best taken care of soldier in the world, yet not supplied as a part of his contract with the government, but tend to make him more contented with his life, more cheerful under hardships and a better soldier, and thus a better citizen."

REPORT OF THE COMMITTEE ON THE CAUSES AND PREVENTION OF INFANT MORTALITY.

By Dr. HENRY MITCHELL, Chairman, Asbury Park, N. J.

The number of deaths among children under five years of age is one of the recognized tests of the degree of progress attained by any given community in the art of right living, and these figures also indicate to some extent the degree of efficiency which has been reached in the local sanitary administration. But the remarkable dimunition which has occurred in the number of deaths among infants in some parts of the United States during the past ten years has been generally ascribed to the recognition by medical practitioners of the advantages which attend cleanly methods in the collection, storage and preparation of cows milk for infants who are artificially fed, and to the faithfulness of mothers and nurses in their adherence to the instructions of their professional advisers. Communicable diseases have, in many parts of the country, been restricted to a greater extent than formerly by the more intelligent management of parents and by more careful isolation of infected persons by the local sanitary authorities, and in the case of scarlet fever a most extraordinary and striking amelioration in its intensity and fatality has occurred. This lessening in the severity of scarlet fever however has been general throughout North America and Europe, and is doubtless due to one of those unexplained changes in the type of this and certain other affections which from time to time occurs. Note, for example, the mildness and low mortality shown by smallpox in the United States during the past few years.

In New Jersey the deaths among children under five years of age, per 10,000 inhabitants, declined from 81.82 in 1892 to 40.23 in 1898. Comparing the deaths among children in thirty-six thickly populated manufacturing districts with those which occur in rural localities, it is found that in cities the number of deaths among this class is 5.39 per 1,000 inhabitants, while in the country districts the number is 2.73 per 1,000. The treatment of diphtheria with antitoxin has diminished the deaths from this disease in every locality where the remedy is scientifically applied. Measles and whooping cough have varied but little in their periodical recurrence, and no modifications of importance have occurred in the fatalities due to these affections. It therefore appears that the most important improvement in the mortality which has occurred among infants has been clearly traced to the application of

measures (1) for preventing the contamination of cows milk and (2) for the destruction of the pathogenic bacteria which may have been allowed admission to it. Comparison of temperature records with the mortality among children in New Jersey for the past nine years indicates that the increased death rate during the summer season of each year is due to more rapid bacterial development in food during the hot months than during the cooler weather of other portions of the year, and there is no evidence to show that the health of breast fed infants is unfavorably affected by ordinary summer temperatures.

Among the measures which are most promising for a further reduction of the mortality among infants, the committee directs attention to the following:

1. *To secure the more general adoption of cleanly methods in the collection, cooling and handling of cows milk.* It is not enough to destroy the bacteria which have been permitted to gain entrance into the milk, for while pathogenic bacteria may be rendered innocuous, the toxins already formed are not affected by high temperatures, hence no manipulation of the milk can be safely substituted for cleanliness in its collection and distribution.

2. *To abolish breeding places for flies near dwellings, and to exclude them from contact with food.*

3. *To encourage the erection of improved tenements in cities, and to show to dwellers in crowded districts the advange of residence in the suburbs.*

4. *To more effectually isolate all cases of the dangerous communicable diseases.*

REPORT OF THE COMMITTEE ON THE TEACHING OF HYGIENE AND THE CONFERRING OF A DEGREE IN PUBLIC HEALTH.

By BENJAMIN LEE, M. D., Chairman, of Philadelphia.

As I understand the object of the appointment of this committee, it is to consider the teaching of hygiene, not simply to physicians, but to the entire nation. It contemplates the education of our children in the elements of hygiene, beginning with the infant school and carrying up the instruction as the mind is open to receive it, to graduation from college or university. The teaching of hygiene at present given in our public schools is, as you are probably aware, to a certain extent a farce, as all of the public school text books are subjected to revision by temperance (so-called) reformers, and the laws generally require that a certain portion — and that an altogether ridiculous and extravagant proportion — of the book should be devoted to the dangers of the use, *not the abuse,* of alcohol and tobacco. It is earnestly to be desired that these books should be substituted by rational text books: and furthermore that the immature mind of the child should not be overburdened by memorizing descriptions of bones and muscles, but should be made to understand the object for which its body was created and the means by which it may keep this wonderful machine in the best possible order for doing service to its Creator and its fellow man. This alone opens a tolerably wide field for study and thought.

The teaching of hygiene in medical schools as an essential part of a medical curriculum is another branch of the subject which should also receive due consideration. And finally, the creation of a public sentiment which will demand that health officers shall not be the most ignorant men in a community, but shall possess such knowledge of hygiene including the essential branch of bacteriology, as will entitle them to receive a diploma in public health. In this way alone, can the colleges be encouraged to furnish such facilities as will warrant them in issuing such a diploma as a result of a carefully considered course, aided by a well equipped laboratory and museum.

So far as your committee has been able to learn, no especial progress has been made during the past year on any of the lines indicated. A committee of the Medical Society of the State of Pennsylvania appointed for the purpose of examining the text-books of physiology and hygiene, designed for the instruction of children, and more especially, those in use in public schools, has, during the past four years

been publishing critiques and reviews of such works in the Pennsylvania Medical Journal, the organ of the Society, to the number of fifty-one (51). In the large majority of cases they find that matters of the utmost importance to the citizen for the conduct of himself, his family and his home, and in which he should receive careful instruction during childhood and youth, have been lightly passed over in order to make room for, and give especial prominence to extravagantly worded and often altogether incorrect statements as to the poisonous effects of tobacco and alcohol on the tissues. It is evident from the report that the hygiene and physiology of many of this class of books is simply a cloak for the introduction of so-called temperance lectures. No cause, even so good a one as that of the prevention of intemperance, can be advanced by the use of false argumentation in its support.

The committee, however, was perhaps too sweeping in its terms of condemnation of the errors contained in the books and too much inclined in its final report to present an argument in favor of the moderate use of alcoholic beverages. This aroused a feeling of antagonism against the report in the minds of many of the members present. It was felt that in accepting the report, the society would be committing itself to that view of the question, and it was therefore laid on the table. But the fact cannot be gainsaid that there is much room for a more intelligent treatment of these subjects in the instruction of the young.

Dr. Jesus Gonzales Urena of Mexico, Mexico, a member of the committee, desires to go on record as "considering it very desirable for hygiene to be taught to children in primary schools and that such teaching should be inspired by the same principles that govern all modern pedagogy, that is to say, that without neglecting the objective method, it should be more educational than instructive as by this means they would be impressed with a truly practical spirit which is at present wanting." They should be taught the dangers of deadly germs, especially those lurking in the sputum, and "the disorders that are brought about by want of cleanliness and ventilation in living rooms." In his opinion, "the anti-alcoholic propaganda ought to be considered as a very important part of the instruction in hygiene at the present time" especially so in his own country "where this evil is causing enormous ravages and where no effort that is intended to remedy it should be considered as wasted."

The necessity for the granting of diplomas in public health is not so urgent in Mexico inasmuch as "the Supreme Board of Health requires a legal medical diploma as a first requisite to filling the position of health officer."

Dr. A. C. Abbott, superintendent of the Laboratory of Hygiene of the University of Pennsylvania and president of the Board of Health of the city of Philadelphia, writes:

"In reply to your question concerning the diplomas in public health, I would say, that the University of Pennsylvania has not yet taken up the matter with that degree of seriousness that might be desired. I have been advocating it more or less steadily for several years. I anticipate that some time in the future, the University will do what is one of its obvious duties. The signs of the times point very directly, to my mind, to the renewed interest in the demonstration of preventive medicine."

A practicing physician in the interior of this State, who is also a practical bacteriologist, in reply to a communication urging the importance of the appointment of physicians possessing knowledge of this kind, as health officers in towns, replies "urging the importance of all physicians uniting in an effort to promote this and other reforms and considers that should physicians thus combine, they could do wonders."

"The physicians as a body, cover the entire field in boroughs, and indeed in larger cities, and I am sure, we as physicians, do not appreciate the power we could wield were we united as one mind in the advancement of this extremely important branch of modern medicine." He adds, "Dr. McCormack of Kentucky spoke very truly, when he said at the recent meeting of our State Society, 'Ignorance and petty jealousies go hand in hand in the profession'."

Dr. Eleanor Parry, Resident Physician at Mount Holyoke College, South Hadley, Mass., a member of the committee, writes: "Since most reforms in education seem to come from above rather than below, it seems to me desirable that pressure should be brought to bear on our higher educational institutions, not merely on professional and technical schools. It is from these institutions that teachers for all grades come, and in nearly every state some requirement is made that physiology be taught. Furthermore, through our colleges and universities general public sentiment should be educated.

"I was surprised to see how little attention was given to this latter subject at the meeting of the National Education Association, in Boston, last July. At present a committee of our college faculty is at work on the subject of the possibility of making a health requirement for college entrance and graduation."

Dr. F. F. Wesbrook, Director of the Bacteriological Laboratory of the Minnesota State Board, considers that it might be well for the Association to place itself on record as favorable to the legal requirement of special training and examination for public health officers, as they find their work very greatly handicapped by the hazy notions

and absolute misconceptions which many of their local health officers show in relation to the various phases of the work. They do not consider it advisable, however, to greatly enlarge the field of teaching in hygiene in the medical schools inasmuch as it is not the function of a medical school to turn out specialists. Such work must be rather in the nature of post-graduate instruction.

I trust that Dr. Wesbrook is present, and that we shall have the benefit of advice from him personally toward carrying out his pertinent suggestions.

As a preliminary step towards securing the measure of the conferment of degrees in public health, the Legislature of Pennsylvania has enacted a law authorizing colleges in the State to establish such a degree and to confer the same on persons who have pursued an adequate course of instruction and passed a satisfactory examination. No college has however yet taken advantage of the authority thus conferred. The educational bodies are evidently waiting for a demand before they furnish a supply. Is it not possible that if they were to take the initiative and create a supply in advance, this action might stir up a demand, leading the more intelligent communities to appreciate the importance of having their health affairs administered by men of guaranteed knowledge and ability?

[NOTE Dr. T. A. Starkey, a member of the committee, presented a verbal report and discussed the report of the committee. This will be found on a subsequent page.— EDITOR.]

REPORT OF COMMITTEE ON SANITARY AID SOCIETIES.

By Dr. GEO. W. GOLER, Chairman, Rochester, N. Y.

Your committee begs leave to present a brief report of the work done during the year at Rochester, N. Y., where some of the experimental work of the committee has been going on during the past two years. As stated in its report last year, the work of the committee has been chiefly directed along educational sanitary lines among the mothers' and parents' clubs of the different schools and before organizations of men and women connected with the different churches of the city. This educational work has been done chiefly through lectures, in nearly all cases illustrated by lantern slides. Fourteen lectures have been arranged by seven different speakers. The subjects include the development of school children; useful and harmful bacteria; city food supplies and their origin; contagious diseases and how to prevent them; consumption and its dangers; care of the teeth; the care of the eyes, noses and throats of children; food for school children. Thirty-eight such lectures have been given during the past year; in nearly every case attended by large numbers of people. When a lecture has been asked for, the list of members of the organization requesting the lecture is asked for by the secretary of the Rochester Public Health Association. To each member the secretary mails an invitation to the lecture, so that aside from the notification of lectures by the organization asking the lecture, each member receives an invitation on behalf of the Rochester Public Health Association. This in brief has been a part of our experimental work in Rochester, N. Y.

Of the detailed work of an association with similar objects in view at Indianapolis under the direction of Miss McClung, of this committee, the American Public Health Association is already familiar. Some similar work at Providence is also being done in coöperation with Dr. Helen C. Putnam, of this committee.

Further than this the experimental work of the Rochester Public Health Association will be extended by the opening of a museum of hygiene where models of sanitary dwellings, old tenements and modern tenements, good and bad systems of plumbing and drainage, exhibits of models, anatomic, physiologic and other hygienic exhibits will be shown. A house for this purpose has already been taken, and a part of the exhibit will soon be installed.

REPORT OF THE COMMITTEE ON DISPOSAL OF GARBAGE AND REFUSE.

By RUDOLPH HERING, Chairman, New York City.

After a careful collection of statistics and visits to such cities that would throw the best light upon what your committee was asked to consider, it made reports in 1896 and 1897, in which the results of its investigations were embodied. Subsequently, and nearly every year, supplemental reports were submitted indicating whatever further progress had been made, describing the existing works, and particularly such as were characteristic of special methods of treatment, in order to show the progress more specifically.

At this time it should be said that the conclusions regarding the proper disposal of refuse materials are as yet not final and generally accepted, excepting as to a few phases of the subject. A desire having been expressed that the conclusions should be restated in the most recent light as to what is believed at present to be the best means of disposal for large and also for small cities, it is our purpose to submit such a statement and utilize in this connection the results of a recent discussion of the subject before the American Society of Civil Engineers. (Transactions Am. Soc. C. E., 1903, p. 95.)

This discussion revealed a fair unanimity of opinion, with the following results:

1. That the different local conditions demand different methods of collection and disposal.

2. That each municipality should select the method which after a careful study of the specific local conditions and a further careful investigation of the cost of securing satisfactory results, proves to be the most economical in construction and maintenance.

3. That the problem must include a consideration of the methods and costs of handling all of the several kinds of refuse, between the origin in the houses and on the streets and the points of final disposal; the four several kinds of refuse being 1, ashes; 2, street sweepings, including manure; 3, dry rubbish and 4, kitchen garbage, swill or slop.

4. That the garbage question has now reached a point where the proper solution of each case requires the aid of the engineering profession, just as the construction of sewerage and other sanitary works.

The problem before us is to effect a sanitary collection and disposal

of the above mentioned four classes of refuse at the least cost. We must therefore ascertain:

A. The objectionable qualities of each class as viewed from a sanitary standpoint, and by which we mean the potency of each class as a medium for the dissemination of disease germs, the avoiding of a nuisance, and the seeking of correction of nuisances involving comfort and decency.

B. The cost of collection from the place of origin and delivery to that of final disposal, and the cost of the disposal itself, modified by any credit that may be due to a saleable value of any part or parts of the refuse.

With regard to the sanitary aspects, we may briefly refer to the different classes as follows:

1. Ashes in their collection and delivery produce dust, the remedy for which is the use of covered receptacles and carts, and, finally, a careful dumping, if necessary, with sprinkling.

2. Street sweepings including manure may contain a large or small amount of organic matter, some of which may break down rapidly and also contain disease germs, possibly those of the most prevalent city disease, namely, tuberculosis. Sprinkling, frequent sweeping and removal in covered carts constitute the most practicable remedy for the evils of improper collection.

The final disposal of street sweepings can be accomplished in several ways. They may be burned, or, under safe conditions, used for filling in lands. When containing a large amount of organic matter, they have also been used for fertilizing purposes.

3. Dry rubbish consists chiefly of wood, paper, straw, leaves, rags, leather, metals, stone ware, glass and sweepings from buildings. Dust with lurking disease germs is its dangerous element, but it also has a mercantile value in its pickings, which in New York City amounts to nearly $2,000 per week.

The collection should be in covered carts to prevent the escape of dust and to avoid odors and other nuisances. The final disposal can be safely accomplished either by dumping on land where practicable, or by cremation, the latter being of course preferable where it can be effected.

4. Kitchen garbage, otherwise called swill or slop, is the refuse chiefly from kitchens, markets and slaughter houses, and consists almost wholly of rejected animal or vegetable matter in solid and liquid form. It is easily broken down, and may produce very offensive odors. It also aids the propagation and growth of lower forms of life, and may through flies facilitate the dispersion of disease germs. On

the other hand, it has a large commercial value, particularly in our country as compared with Europe because of our more wasteful habits.

It is generally conceded that the collection of garbage should be made by the use of water-tight and covered receptacles and wagons, and that it should be frequent; in warm weather daily, and in cold weather may be less often.

The final disposal, of garbage is now generally effected in the following ways:

a. *Feeding to Swine.*

This method prevails to-day in many of our cities, chiefly in New England. If garbage is kept from other refuse which would injure the food qualities, and if collected daily, there should be no objection to this practice either from a hygienic or commercial standpoint. If practicable, it yields a greater revenue than any other method of disposal. We should, however, limit it to conditions where disease germs may not reasonably be expected to enter and where odors of putrefaction, or otherwise, will give rise to no annoyance. Experience has shown it to be practicable in small cities, and in the case of hotels and eating-houses of large cities.

b. *Dumping on Land.*

When not mixed with other refuse by which it can be diluted, dumping is objectionable on account of subsequent putrefaction. When mixed with other matter, as ashes and dry rubbish, it will depend upon local conditions as to whether it would be objectionable or not. When mixed with dry refuse, burning is frequently resorted to, but is seldom satisfactory.

c. *Dumping into Large Volumes of Floating Water.*

Opportunities for a satisfactory disposal in this manner will be rare, and advantage should not be taken thereof, if other means of disposal are available.

d. *Plowing into Soil.*

This method will be rarely satisfactory in this country, on account of the expense of properly doing the work. In Europe it is considered favorably in several cities, because it can satisfactorily dispose of disease germs and odors, and because the gradual nitrification of the organic matter produces a fertile soil.

e. *Extracting Grease.*

Under this head we have the so-called reduction process as adopted in a large number of American cities. It is especially available in our country because of our wastefulness in the use of food products. In Europe the process is nowhere used, because the amount of grease

left in the garbage and which could be extracted is too small to justify the expense of extraction.

The objection to this method is chiefly confined to the odors which may escape from badly managed plants, which are generally operated as a business undertaking for profit, and where the conflicting interests will naturally involve the constant danger of a nuisance. It is practicable, however, to conduct such works without offense, particularly when remote from human habitations.

Almost the sole advantage of this process lies in the profit to be derived from the sale of its products.

f. *Cremating the Organic Matter.*

By far the largest number of cities, and particularly the smaller ones, dispose of their garbage by cremation. The advantage of burning is the destruction of all foul matter, including all pathogenic micro-organisms. The objections are the odorous fumes and dust which are apt to escape from the chimney. This escape, however, is not a necessary result of the process. In Europe such burning of the refuse is the commonly adopted method, and is used even in well-built-up parts of the cities. It is not offensive when the furnaces are properly designed and operated. In our country both design and operation differ more or less from the European furnaces, generally to our disadvantage, as has been frequently reported. It will be necessary, and it is entirely practicable from an engineering standpoint, to construct our furnaces to suit our own conditions, which produce refuse that slightly differs from similar material in Europe, and which difference has been improperly claimed as the cause for the different designs.

In order to decide upon the best manner of disposing of the refuse of any city, granting that under suitable conditions any of the above mentioned methods may be practiced to satisfy the sanitary demand, if the necessary price is paid, the following requirements appear to be necessary.

The city should ascertain the cost of each one of the most practicable methods from those mentioned above, when developed to a point of satisfactory efficiency, both as to construction and maintenance. The least expensive one will then be the preferable method. Such an investigation may prove that some two or three, or perhaps all four, classes of the refuse can be treated economically if mixed and disposed of by the same process. In a number of small cities of this country, as well as generally in England, this combined disposal is the most preferable one when it is effected by burning. In the case of New York it is stated by the street cleaning commissioner that the

most economical method for that city is a different disposal for each of the four classes of refuse.

Wherever it is found economical to extract grease from the garbage, a separate disposal of a mixture of the other classes may also be economical.

In conclusion, it may now be said that while there are several methods of satisfactory disposal, every one will not be the best for all cities. Each city should therefore study the question as related to its own special conditions, and from the large experience both in Europe and at home, select what is found best for itself.

THE SANITARY DISPOSAL OF MUNICIPAL AND INSTITUTIONAL WASTE BY CREMATION.

By WILLIAM F. MORSE, Sanitary Engineer, New York City.

A review of the field of disposal of city waste by various forms of crematories shows that in three years there have been numbers of furnaces put in operation, which for various reasons have been retired from service, abandoned or suppressed.

There are several cases where crematories have been hastily constructed under difficult conditions, built with materials that were not competent to sustain heat, erected under contracts which required a performance of work impossible to execute, and which were found to be unreliable and inefficient.

Many instances could be quoted where contracts were entered into by parties who were confident that they had achieved good results on paper, and who found that when a practical application of their theory was made they had only attained grievous failure. Even in the largest city in the country the commissioner of street cleaning entered into a contract for five years with a company for the cremation of the garbage and refuse of one of the boroughs of the city. There was constructed by this company a large crematory furnace, which, when put into service was found to be entirely inadequate for destroying the total amount of garbage collected, and in attempting this, created such unsanitary and obnoxious fumes that the board of health of the city compelled its suppression.

It would be a hopeless task to enumerate in detail the various instances of failure, or to explain the causes of the unsatisfactory and inefficient results produced by these so-called sanitary and efficient cremating furnaces. Suffice it to say, that of the seventy-five crematories which three years ago were in operation or were contracted for, there are to-day less than forty in continuous use.

It is obvious to any one examining the subject with any degree of care that if the disposal of waste by cremation is to make real progress, there must be radical changes in methods of business, in design, material and construction, and in the operation of the furnaces.

THE UTILIZATION OF HEAT FOR POWER.

But there is another and a brighter side to the matter. There have been distinct advances made in the direction of the sanitary destruction

of waste of great business establishments, in public and private institutions, and in several departments of the U. S. Government.

Some of the leading engineers of the country engaged by the great construction companies were very quick to seize upon the idea that the waste of a building, when considerable in amount, can be turned into steam power by the proper agency if this be approved by the health and fire departments, involving neither the expenditure of large sums of money nor the re-arrangement of the machinery plant of the building.

In the basement of several of the great department stores have been placed destructor furnaces connected with the upper stories of the building by chutes which conduct the waste to a room where it is sorted over by men in charge of the operation of the plant, the valuable portions recovered for market, and the remainder fed into the destructor for fuel.

This method of dealing with department store waste is expeditious, inexpensive and sanitary. The heat produced by the waste more than pays the expense connected with the system, and may be applied in several different ways. In one case, by means of a flue attachment to an economizer, it is utilized for heating the feed water for a battery of boilers aggregating 1000 H. P., the temperature of the water being raised to 260 degrees without the consumption of other fuel than the waste of the building. This means a saving from three to four tons of coal per day during the time that the waste is used.

When it is taken into account that this process may continue for the life of the business at an annual saving of something like $3,000 for fuel, besides the expense formerly incurred for the removal of the waste from the building, the value of this method will be very apparent.

In another case the heat from a destructor furnace is introduced under the fire boxes of a boiler of large capacity, and used as an auxiliary for the production of steam power. This method is capable of being applied to almost any form of boiler by so arranging the furnace as to send the heat directly into the fire-boxes without interference with the grate bars or with the boiler itself.

Again, in another instance a steam bolier is attached to the destructor placed in the basement of a large hotel, and which has a daily capacity of upwards of four tons of garbage. The steam generated by the combustion of this mass of waste is used as an auxiliary to a battery of boilers, or it may be used for special purposes in the building. Heat produced from the destruction of any kind of waste may be employed for superheating steam; for hot water circulation in the building, and for other purposes, all economical and efficient.

INSTITUTIONAL WASTE.

Among the very first in this country to recognize the value of destructor furnaces were the sanitariums, hospitals and other public institutions, and for more than twelve years in some of the large cities in the country the waste of hospitals and large institutions has been destroyed without insanitary results and with perfect economy and efficiency in operation.

A particular field for this apparatus is in connection with the sanitariums for the improvement of the condition of persons suffering from tuberculosis. The method is also employed for the disposal of infected matter from cities where contagious diseases have been in progress. No town can be said to be protected unless it is provided with a destructive furnace which will consume this dangerous matter, and in connection with which a municipal steam disinfecting plant can be maintained with great advantage to the town. The United States government has recognized the usefulness of this method of waste disposal, and has installed several destructor furnaces of one particular type which is especially adapted to the requirements of the work done in laboratories, sanitariums and hospitals, and at army posts, navy yards, and naval stations.

THE DISPOSAL OF CITY REFUSE.

There is another field of usefulness for the employment of destructive furnaces which the experience of four years has shown to be a factor for sanitation and economy in the administration of municipal government. The collection of refuse or combustible rubbish is about twenty per cent of the whole body of municipal waste. This twenty per cent is further sub-divided into articles that have value when manufactured into other forms. If we take the article, paper, probably one of the cheapest manufactured products in the world and certainly one thing in the refuse of American cities which is found in abundance, we shall discover that this very fact makes it a most troublesome waste to deal with.

It is stated that this country produces annually six billion pounds of paper, which enormous output has grown from the product of one little mill which manufactured paper from rags in Philadelphia in 1690. The annual consumption of paper in this country is fifty pounds for each individual.

Colonel Geo. E. Waring, Jr., discovered seven years ago, by means of an experimental station in New York City, that paper has a marketable value if collected by the city agents and sorted out into its various

grades. For several years under his administration the city of New York profited by the recovery of paper, receiving thereon a price which varied from sixty cents to $1.10 per ton. The work was conducted by contract, the city defraying the expense of construction and the maintenance of the plant. The contractor received all the proceeds, and may be presumed to have made a very handsome margin over and above expenses. This form of disposal of city refuse has been carried to greater extent by the installation of a refuse utilization station in Boston, a description of which was given in the proceedings of this Association for 1900, and which has been operating for nearly five years.

The city of Buffalo is about to construct a similar plant which will recover a large proportion of the valuable parts of the city refuse and destroy the remainder in a destructor, the heat from which will be utilized for furnishing power to pump the sewage of a large section of the city, containing nearly 200,000 people.

These examples prove what has before been stated in regard to the market value of this portion of city refuse, and that the returns are sufficient to show a profit on the work performed. When the heat developed by burning the worthless portions can be utilized the result is a revenue that becomes a large asset for the credit side of the municipal ledger. As for the sanitary side of it, when it is considered that the usual method of disposal of this city refuse is to dump it on the ground and allow it to be picked over by irresponsible parties who seek to recover such parts as may be marketable, often in a soiled and even filthy condition, and when it is remembered that there is no oversight of this work, and that any infected or otherwise insanitary articles may be brought back to direct contact with the inhabitants of the town, it may be well believed that disposal by fire is the only adequate remedy and agency that should be employed.

THE DISPOSAL OF MIXED MUNICIPAL WASTE.

There is no place where the destruction of municipal waste is of more importance than in the tropical regions of this country, since the rapid decay that seizes upon all exhausted particles of animal and vegetable substance, requires swift and efficient method of disposal.

When Manila was taken possession of by the United States troops they found an insanitary condition of affairs existing under the Spanish regime which was in the highest degree offensive and dangerous. Indeed, there had been so little attention paid to the preservation of health that no precautions were taken for the disposal of waste. It

was simply thrown to one side as a matter of too little consequence to be regarded, and it took its revenge by propagating disease and death.

The Americans found it necessary to fight as strongly against disease as against the Spanish troops and the insurgents. The health commission appointed by the government instituted competition for the construction of a furnace which would destroy all the waste of the city. There were five proposals submitted, and the plans of an American company were accepted and promptly carried into effect. A good many difficulties in the way of construction were encountered. Almost no material was procurable in the Philippines; labor had to be largely imported from Hong Kong, and the location of the plant was on marshy ground, requiring great labor to prepare. In four and one-half months the work was completed and turned over to the Government, and it is the largest single plant in operation in the country. Reports from there indicate that there is destroyed by this furnace a larger amount of waste than was stipulated for in the contract, which was to be upwards of 130 tons daily. The secret of the complete and rapid combustion of this waste is a matter which has heretofore escaped the attention of most American destructor builders. When garbage is destroyed in the ordinary American crematory by natural chimney draft the heat rarely rises to a temperature above 800 to 1000 degrees. the proportion of 40% to 60% of moisture in the garbage delays ignition and combustion, and the use of fuel for the evaporation of this water is necessary. But if combustion is stimulated by forced draught in the ash-pit of the fire boxes, and the manipulation and charging of the furnace is so managed as to dry a portion of the garbage for use as fuel, then the combustion is not only maintained but is raised to a higher temperature than it is possible to attain by natural draft.

This is the principle upon which English destructors operate and is the same as that sucessfully employed in the foregoing instance. The same apparatus in similar constructions in the United States will destroy an equivalent amount of mixed wastes from a city with the same proportionate expenditures for fuel.

POWER FROM MUNICIPAL WASTE.

The final word in favor of the disposal of city waste by fire has yet to be said. Undoubtedly it will be a repetition of the statement made by the eminent English electrical engineer, Prof. Forbes, when said that the waste of any city when properly consumed and the heat applied to the production of electric power, would be sufficient to furnish a light of eight candle-power for every individual in the city during two hours when light is necessary. At the time when this statement was made it

seemed to present a fanciful and impossible idea, but it has been more than realized by the results of practical work. Within four or five years there has developed in England a class of destructor which will consume every kind of municipal wastes without nuisance, will develop steam power in the proportion of one and one-half to two pounds of water evaporated for every pound of waste consumed, and will produce a residuum useful for many kinds of municipal work.

Reports received from the latest installation of this powerful apparatus show that actual results are overwhelmingly in support of the statement made by Professor Forbes.

A paper read by Mr. W. F. Goodrich, M. I. C. E., before the *British Association for the Advancement of Science* at Southport, in September last, contains perhaps the best report of this line of sanitary work that has yet been published. The writer shows that in twenty-five years to the two installations in two towns there had been added 180 more, and also that the first two "Fryer" destructors built at Manchester and Leeds were still in use, but both have been fitted with forced draught. This innovation, only some five or six years in use, is "the really vital improvement" in furnace construction. By this means the temperature has been raised from about 500 degrees in 1896 at Hull before the adoption of forced draught, to 3000 degrees in 1902 at Walker-on-Tyne.

It has led to the use of powerful steam boilers developing one horse-power of steam from the combustion of ten pounds of "town refuse" corresponding to our mixed city garbage, ashes and refuse, and very nearly the same in all essential particulars.

The high temperature system has rendered nuisance practically impossible, the improvements in design have prevented the escape of dust, and the residuums produced are perfectly inoffensive and used for a variety of purposes.

One ton (2,240 lbs.) of average refuse will generate a similar quantity of high pressure steam.

Of the 180 towns in Great Britain where destructors are installed, 63 combined these with electricity works for the lighting of the places, and in 40 towns the destructors were combined with sewage works.

There is generated from one ton of town's refuse at Nelson, 40 board of trade electrical units, the average being 30 units per ton. equivalent to 40 horse-power hours of energy.

Five years ago only two towns had adopted destructors combined with electricity works, but since then 61 others have accepted this method. This has been done in many places, notably Liverpool and Nottingham where the towns have already electric lighting works of large capacity, as the value of this means became better known.

The destructors are centrally located, reducing the cost of cartage to the minimum. They are placed in close proximity to public offices, schools and all classes of buildings, without producing noxious fumes, offensive odors or other objectionable results.

In three cases the destructors are combined with water works, delivering the water supply of the town by the destruction of its waste.

There are 1,650 destructor cells in operation or in course of construction in Great Britain, with 300 steam boilers employed. There are in Australia, New Zealand, South Africa, Germany, France, Belgium and South America destructors built after the same plans, destroying miscellaneous city waste of every class, employing the steam power for various purposes, and operating in the same efficient, sanitary and entirely satisfactory manner that has been so well demonstrated by the work in the English cities and towns.

This, then, is the ultimate successful result we should look forward to in this country. Our reduction friends may claim that the conditions are different, the situations unlike, the results not to be attained. All these objects are trivial and misleading. There is no radical difference in the character of the people, the manner of living, or the waste elements discharged from the life of the public.

With the same agencies acting under similar conditions, employed upon the same work, it is as certain as daylight that equally profitable results are to be obtained. It is a question of the clear understanding of the results already achieved abroad, and of opportunity for the successful application of the same methods in this country.

SOME STATISTICS OF GARBAGE DISPOSAL FOR THE LARGER AMERICAN CITIES IN 1902.

By C.-E. A. WINSLOW, and P. HANSEN.

From the Biological Laboratories of the Massachusetts Institute of Technology, Boston, Mass.

In connection with the work of the course in municipal sanitation at the Massachusetts Institute of Technology, the writers attempted to collect a certain amount of first-hand information as to the condition of garbage disposal practice in the United States in the year 1902. Blanks were sent out to cities of over 25,000 population (161 in number), and after several attempts replies were finally received from 155 of them. Results obtained, in this manner, by circular are of course subject to many errors. Our inquiry was more limited in its scope than that undertaken by the committee of the American Public Health Association on the "Disposal of Garbage and Refuse" presented by Mr. Rudolph Hering in 1897[1], and we hope to add little to the masterly treatment of the whole subject of garbage disposal in Dr. C. V. Chapin's "Municipal Sanitation"[2]. Nevertheless, in the belief that our data may furnish some fresh material for students of this important problem, we have thought it worth while to publish the tabulated results.

The most general conditions of the garbage problem in the larger American cities in 1902 is indicated in Table I where are given the answers to the question whether garbage is regularly collected and by whom, whether waste materials are separated into classes before treatment and what treatment is accorded to each class.

TABLE I.

GARBAGE DISPOSAL IN THE LARGER AMERICAN CITIES.

Number.	City.	Population 1900.	Garbage regularly collected.	By whom collected.
1	Akron, Ohio	42,728	Yes	Private parties
2	Albany, N. Y.*	94,151	No	
3	Allegheny, Pa.	129,896	Yes	Contractor
4	Allentown, Pa.*	35,416	Yes	Contractor
5	Altoona, Pa.	38,973	No	
6	Atlanta, Ga.	89,872	Yes	City
7	Atlantic City, N. J.	27,838	Yes	Contractors and private parties
8	Auburn, N. Y.	30,345	Yes	Contractors
9	Augusta, Ga.	39,441	Yes	City
10	Baltimore, Md.*	508,957	Yes	City
11	Bay City, Mich.	27,628	Yes	Contractors
12	Bayonne, N. J.	32,722	Yes	City
13	Binghampton, N. Y.	39,647	No	Private parties
14	Birmingham, Ala.	38,415	Yes	Contractor
15	Boston, Mass.	560,892	Yes	City and contractor
16	Bridgeport, Conn.	70,996	Yes	Contractor
17	Brockton, Mass.	40,063	Yes	City
18	Buffalo, N. Y.	352,387	Yes	City
19	Butte, Mont.*	30,470		
20	Cambridge, Mass.	91,886	Yes	City
21	Camden, N. J.	75,935	No	City
22	Canton, Ohio*	30,667	No	Private parties
23	Cedar Rapids, Iowa.	25,656	Yes	Contractor
24	Charleston, S. C.	55,807	Yes	City
25	Chattanooga, Tenn.	30,154	Yes	City
26	Chelsea, Mass.	34,072	Yes	Private parties
27	Chester, Pa.	33,988		
28	Chicago, Ill.	1,698,575	Yes	City
29	Cincinnati, Ohio.	325,902	Yes	City
30	Cleveland, Ohio.	381,768	Yes	Contractors

TABLE I.

GARBAGE DISPOSAL IN THE LARGER AMERICAN CITIES.

Separation of material.	Disposal of ashes.	Disposal of combustible wastes.	Disposal of garbage.	Number.
All separated	Not given	Not given	Not given	1
			Dumped and fed to swine	2
Only G. collected	Dumped	Burned on dump	Used for fertilizer	3
G. separated	Dumped	Dumped	Part buried, part used for fertilizer	4
	Dumped	Dumped	Burned in cook stoves	5
All separated		Cremated	Cremated	6
G. separated	Not collected	Not collected	Cremated	7
All separated	Dumped	Dumped	Buried four feet deep	8
Not separated	Burned on dump	Burned on dump	Burned on dump	9
G. separated	Dumped	Dumped	Used as fertilizer, fed to swine	10
G. separated, A. and C. W. sometimes	Used upon public streets	Burned	Used as fertilizer, and fed to swine	11
Not separated	Dumped	Dumped	Dumped	12
Not separated	Dumped	Not known	Buried or burned in cook stoves	13
Not separated	Dumped	Dumped	Dumped	14
All separated	Dumped, taken to sea	Dumped, utilized	Reduced	15
G. separated	Dumped	Burned	Cremated	16
All separated	Dumped	Burned	Fed to swine	17
G. separated	Dumped	Dumped	Reduced	18
			Cremated	19
All separated	Dumped	Burned	Fed to swine	20
All separated	Dumped	Cremated	Cremated	21
			Cremated	22
G. separated		Burned	Dumped and fed to swine	23
Not separated	Dumped	Dumped	Dumped	28
Not separated	Dumped and partly burned	Dumped and partly burned	Dumped and partly burned	25
G. separated	Dumped	Burned	Fed to swine	26
				26
Not separated	Dumped	Dumped	Dumped	24
All separated	Dumped	Dumped	Reduced	29
G. separated	Dumped	Dumped	Reduced	30

TABLE I — Continued.

Number.	City.	Population 1900.	Garbage regularly collected.	By whom collected.
31	Columbus, Ohio	125,560	Yes	Contractors
32	Council Bluffs, Iowa	25,802	No	Private parties
33	Covington, Ky	42,988	Yes	City
34	Dallas, Texas	42,638	Yes	City and private parties
35	Davenport, Iowa	35,254	Yes	City
36	Dayton, Ohio	85,333	Yes	City
37	Denver, Colo	133,859	Yes	Contractors
38	Des Moines, Iowa*	62,139		
39	Detroit, Mich	285,704	Yes	Contractor
40	Dubuque, Iowa	36,297	Yes	Contractor
41	Duluth, Minn	52,969	No	Private parties
42	Easton, Pa	25,238	No	Private parties
43	East St. Louis, Ill	29,655	No	
44	Elizabeth, N. J	52,130	Yes	Contractor
45	Elmira, N. Y	35,672	No	
46	Erie, Pa	52,733	Yes	Contractor
47	Evansville, Ind	59,007	Yes	City
48	Fall River, Mass	104,863	Yes	Contractor
49	Fitchburg, Mass	31,531	Yes	Contractors
50	Fort Wayne, Ind	45,115	Yes	City
51	Fort Worth, Texas	26,688	No	Private parties
52	Galveston, Texas	37,789	Yes	City
53	Gloucester, Mass	26,121	Yes	Private parties
54	Grand Rapids, Mich	87,565	Yes	Private parties
55	Harrisburg, Pa	50,167	Yes	Private parties
56	Hartford, Conn	79,850	Yes	Contractor
57	Haverhill, Mass	37,175	Yes	Contractor
58	Hoboken, N. J	59,364	Yes	Contractor
59	Holyoke, Mass	45,712	Yes	Contractor
60	Honolulu, H. I	39,306	Yes	City
61	Houston, Tex.*	44,633	Yes	City
62	Indianapolis, Ind	169,164	Yes	Contractor
63	Jackson, Mich	25,180	Yes	Private parties
64	Jacksonville, Fla	28,429	Yes	City

TABLE I — Continued.

Separation of material.	Disposal of ashes.	Disposal of combustible wastes.	Disposal of garbage.	Number.
G. separated	Dumped	Dumped	Reduced	31
Not separated	Dumped	Dumped	Covered on dump	32
All separated	Dumped	Burned on dump	Burned on dump	33
G. separated	Dumped	Dumped	Cremated	34
G. only collected	Dumped		Dumped in river	35
All separated	Dumped	Dumped	Buried and thrown into river.	36
All separated	Dumped	Dumped	Fed to swine	37
			Cremated	38
All separated	Dumped	Dumped	Reduced	39
G. separated	Dumped	Dumped	Dumped in river	40
				41
All separated	Dumped		Dumped in river	42
				43
Not separated	Dumped	Dumped	Dumped	44
Not separated	Dumped	Dumped	Dumped	45
G. only collected	Dumped	Dumped	Given to farmers and reduced.	46
G. separated	Dumped	Burned	Cremated	47
G. separated	Dumped	Dumped	Fed to swine	48
All separated	Dumped	Burned	Fed to swine	49
All separated	Dumped	Cremated	Cremated	50
Not separated	Dumped	Dumped	Dumped	5
All separated	Dumped	Burned	Burned and dumped	52
G. separated	Dumped	Dumped	Fed to swine	53
G. separated	Dumped	Burned	Cremated	54
Not separated	Dumped	Dumped	Dumped	55
G. separated	Dumped	Dumped	Buried	56
G. separated	Dumped	Dumped	Fed to swine	57
Not separated	Dumped	Dumped	Dumped	58
G. separated	Dumped	Dumped	Used for fertilizer, fed to swine	59
Not separated	Dumped or taken to sea	Burned	Burned or taken to sea	60
Not separated	Dumped	Dumped	Dumped	61
All separated	Dumped		Used for fertilizer	62
Not separated	Dumped		Given to farmers	63
Not separated	Dumped	Cremated	Cremated	64

TABLE I — Continued.

Number.	City.	Population 1900.	Garbage regularly collected.	By whom collected.
65	Jersey City, N. J.	206,433	Yes	City
66	Johnstown, Pa.	35,936	Yes	Private company
67	Joliet, Ill.	29,353	Yes	City
68	Joplin, Mo.	26,023	Yes	Contractor
69	Kansas City, Kans.	51,418		
70	Kansas City, Mo.	163,752	Yes	City
71	Knoxville, Tenn.	32,637	Yes	City
72	La Crosse, Wis	28,895	Yes	City
73	Lancaster, Pa.	41,459	Yes	Contractor
74	Lawrence, Mass.	62,559	Yes	City
75	Lexington, Ky.	26,369	No	Private parties
76	Lincoln, Neb.	40,169	No	Private parties
77	Little Rock, Ark.	38,307		
78	Los Angeles, Cal.	102,479	Yes	Contractor
79	Louisville, Ky.*	204,731	Yes	Contractors
80	Lowell, Mass.*	94,969	Yes	City and private parties
81	Lynn, Mass.	68,513	Yes	City
82	McKeesport, Pa.	34,227	Yes	Private parties
83	Malden, Mass.	33,664	Yes	City
84	Manchester, N. H.	56,987	Yes	City
85	Memphis, Tenn.	102,320	Yes	City
86	Milwaukee, Wis.	285,315	Yes	City
87	Minneapolis, Minn.	202,718	Yes	City
88	Mobile, Ala.	38,469	Yes	City
89	Montgomery, Ala.	30,346	Yes	City
90	Nashville, Tenn.	80,865	Yes	City
91	Newark, N. J.	246,070	Yes	Contractor
92	New Bedford, Mass.	62,442	Yes	Contractor
93	New Britain, Conn.	25,998	Yes	Contractor
94	Newcastle, Pa.*	28,339	Yes	Private parties
95	New Haven, Conn.	108,027	Yes	Contractor
96	New Orleans, La.	287,104	Yes	City
97	Newport, Ky.	28,301	Yes	City

TABLE I — Continued.

Separation of material.	Disposal of ashes.	Disposal of combustible wastes.	Disposal of garbage.	Number.
Not separated	Dumped	Dumped	Dumped	65
Not separated	Dumped	Burned	Dumped	66
All separated	Dumped	Cremated	Cremated	67
All separated, A not collected	Unknown	Burned	Burned or fed to swine	68
				69
G. only collected			Dumped in river	70
Not separated	Dumped	Dumped	Dumped	71
G. separated	Dumped	Dumped	Dumped in river	72
All separated	Dumped	Cremated	Cremated	73
G. separated	Dumped	Dumped	Fed to swine	74
				75
Not separated	Dumped	Burned	Dumped	76
				77
All separated	Dumped	Not collected	Cremated	78
G. separated	Dumped	Dumped	Dumped	79
All separated	Dumped	Dumped	Fed to swine	80
All separated	Dumped	Dumped	Fed to swine, taken to sea	81
A. separated	Dumped	Cremated	Cremated	82
G. separated	Dumped	Dumped	Fed to swine	83
G. separated	Dumped	Dumped	Fed to swine	84
A. separated	Dumped	Cremated	Cremated	85
G. separated	Dumped	Dumped	Cremated	86
All separated	Dumped	Cremated	Cremated and burned on dumps	87
Not separated	Dumped	Dumped	Dumped	88
Not separated	Dumped	Dumped	Dumped	89
G. separated	Dumped	Dumped	Dumped in river	90
Not separated	Dumped	Dumped	Dumped	91
G. separated			Reduced	92
G. separated	Dumped	Dumped	Fed to swine, burned	93
All separated	Dumped	Burned on dump	Burned on dump	94
G. separated	Dumped	Dumped	Fed to swine	95
All separated	Dumped	Dumped	Dumped in river	96
G. separated	Dumped	Dumped	Dumped on land, and into river	97

TABLE I — Continued.

Number.	City.	Population 1900.	Garbage regularly collected.	By whom collected.
98	Newton, Mass.	33,587	Yes	Contractor
99	New York, N. Y.	3,437,202	Yes	Contractor in Brooklyn. City in Manhattan
100	Norfolk, Va.	46,624	Yes	City
101	Oakland, Cal.	66,960	Yes	Private parties
102	Omaha, Neb.	102,555	Yes	Contractor
103	Oshkosh, Wis.*	28,284		
104	Passaic, N. J.	27,777	Yes	Contractor
105	Paterson, N. J.	105,171	Yes	Contractor
106	Pawtucket, R. I.	39,231	Yes	Contractor
107	Peoria, Ill.	56,100	No	Private parties
108	Philadelphia, Pa.	1,293,697	Yes	Contractor
109	Pittsburg, Pa.	321,616	Yes	Contractor
110	Portland, Me.	50,145	Yes	Private parties and city
111	Portland, Oregon.	90,426	No	Private parties
112	Providence, R. I.	175,597	Yes	Contractors
113	Pueblo, Colo.*	28,157	No	
114	Quincy Ill.	36,252	Yes	Contractor
115	Racine, Wis.	29,102	No	Private parties
116	Reading, Pa.*	78,961	Yes	Contractor
117	Richmond, Va.	85,050	Yes	City
118	Rochester, N. Y.	162,608	Yes	Private parties
119	Rockford, Ill.	31,051	Yes	Contractor
120	Sacramento, Cal.	29,282	Yes	Private parties
121	Saginaw, Mich.*	42,345	No	Private parties
122	St. Joseph, Mo.	102,979	Yes	Private parties, city
123	St. Louis, Mo.	575,238	Yes	Contractor
124	St. Paul, Minn.	163,065	Yes	City
125	Salem, Mass.	35,956	Yes	City
126	Salt Lake City, Utah*	53,531	Yes	City
127	San Antonio, Texas.	53,321	Yes	City
128	San Francisco, Cal.	342,782	Yes	Private parties
129	Savannah, Ga.	54,244	Yes	City
130	Schenectady, N. Y.	31,682	Yes	Private parties

TABLE I — Continued.

Separation of material.	Disposal of ashes.	Disposal of combustible wastes.	Disposal of garbage.	Number.
All separated	Dumped	Burned	Fed to swine	98
All separated	Dumped on land and at sea	Sold and dumped at sea	Reduced	99
All separated	Dumped	Cremated	Cremated	100
Not separated	Dumped	Dumped	Dumped	101
Usually separated	Dumped	Dumped	Fed to swine, dumped	102
			Dumped	103
C. W. separated	Dumped	Burned	Dumped	104
G. separated	Dumped	Burned on dump	Reduced	105
G. separated	Dumped	Dumped	Fed to swine	106
Not separated	Dumped	Dumped	Dumped	107
G. separated	Dumped	Dumped	Reduced	108
G. separated			Reduced	109
G. separated			Fed to swine	110
All separated	Dumped	Cremated	Cremated	111
G. separated	Dumped	Burned on dump	Fed to swine	112
			Dumped, fed to swine	113
All separated	Dumped		Fed to swine	114
G. separated				115
G. separated	Dumped		Buried	116
All separated	Dumped		Cremated	117
G. separated	Dumped		Used by farmers	118
G. separated	Dumped	Dumped	Fed to swine, dumped	119
Not separated	Dumped	Dumped	Fed to swine, dumped	120
G. separated	Dumped	Dumped	Fed to swine, buried	121
All separated	Dumped on land or in river	Burned on dump	Dumped in river	122
G. separated	Dumped	Dumped	Reduced	123
G. separated	Dumped	Dumped	Fed to swine and used as fertilizer	124
G. separated	Dumped	Dumped	Fed to swine	125
All separated	Dumped	Burned on dump	Buried	126
Not separated	Burned in pits	Burned in pits	Buried in pits	127
Not separated	Cremated	Cremated	Cremated	128
All separated	Dumped	Burned on dump	Used as fertilizer	129
Not separated	Dumped	Dumped	Dumped	130

TABLE I — Concluded.

Number.	City.	Population 1900.	Garbage regularly collected.	By whom collected.
131	Scranton, Pa.	102,026	Yes	Private company
132	Seattle, Wash.*	80,671	Yes	Private parties
133	Sioux City, Iowa	33,111	Yes	City
134	Somerville, Mass	61,643	Yes	City
135	South Bend, Ind.*	35,999	No	Private parties
136	South Omaha, Neb	26,001	No	Private parties
137	Spokane, Wash.*	36,848	No	Private parties
138	Springfield, Ill	34,159	No	Private parties
139	Springfield, Mass	62,059	Yes	City
140	Springfield, Ohio	38,253	No	Contractor
141	Superior, Wis	31,091	No	City and private parties
142	Syracuse, N. Y	108,374	Yes	City
143	Tacoma, Wash	37,714	No	Private parties
144	Taunton, Mass	31,036	Yes	City
145	Terre Haute, Ind	36,673	Yes	Contractor
146	Toledo, Ohio	131,822	Yes	Contractors
147	Topeka, Kans.*	33,608	No	
148	Trenton, N. J	73,307	Yes	City
149	Troy, N. Y.*	60,651	Yes	City
150	Utica, N. Y	56,383	Yes	Contractor
151	Washington, D. C	278,718	Yes	Contractor
152	Waterbury, Conn	45,859	Yes	Private parties
153	Wheeling, W. Va	38,878	Yes	Contractor
154	Wilkesbarre, Pa	51,721	Yes	Contractor
155	Williamsport, Pa	28,757	Yes	Private parties
156	Wilmington, Del	76,508	Yes	Contractor
157	Woonsocket, R. I	28,204	No	
158	Worcester, Mass	118,421	Yes	Private parties
159	Yonkers, N. Y	47,931	Yes	City
160	York, Pa	33,708	Yes	City
161	Youngstown, Ohio	44,885	No	Private parties

TABLE I — Concluded.

Separation of material.	Disposal of ashes.	Disposal of combustible wastes.	Disposal of garbage.	Number.
All separated	Dumped	Cremated	Cremated	131
Not separated	Dumped	Dumped	Dumped	132
G. separated	Dumped	Dumped	Dumped	133
All separated	Dumped	Burned on dump	Fed to swine	134
Not separated	Dumped	Dumped	Dumped	135
All separated	Dumped	Dumped in river	Dumped in river	136
Not separated	Dumped in river	Dumped in river	Dumped in river	137
Not separated	Dumped	Dumped	Dumped	138
G. separated	Dumped	Dumped	Fed to swine	139
G. separated	Dumped		Fed to swine, dumped	140
All separated	Dumped	Dumped	Dumped	141
G. separated	Dumped	Dumped	Reduced	142
All separated	Dumped	Burned on dump	Dumped	143
All separated	Dumped	Burned	Fed to swine	144
A. separated	Dumped	Cremated	Cremated	145
G. separated			Plowed into ground	146
			Cremated	147
A. separated	Dumped	Cremated	Cremated	148
Not separated	Dumped	Dumped	Dumped	149
All separated	Dumped	Dumped	Reduced	150
All separated	Dumped	Cremated	Reduced	151
G. separated	Dumped	Dumped	Cremated	152
A. separated		Cremated	Cremated	153
All separated	Dumped	Dumped in river		154
Not separated	Dumped	Dumped	Dumped	155
G. separated	Dumped		Cremated	156
	Dumped	Dumped	Dumped	157
All separated	Dumped	Dumped	Fed to swine	158
G. separated	Dumped	Dumped	Cremated	159
G. separated	Dumped	Dumped	Taken to phosphate works	160
All separated	Dumped	Cremated	Cremated	161

It is probable that some cities reporting no regular collection of garbage are really better cared for in this respect than some which state that garbage is regularly collected by private parties, but on the face of the returns, 29 cities out 155 have no systematic method of collection. Of 146 cities reporting on the routine of collection, only 61 state that the removal of garbage is in the hands of municipal officers, while in 85 cases contractors or private parties are said to exercise this function. The proportion of cities collecting their own garbage is thus about the same as that reported by Hering in 1896[2]. The results tabulated by Goodrich[3] indicate that the collection of garbage by contract is the cheaper method although that author's personal opinion contradicts his own figures. At any rate, it appears that even in 1902 only some 40 per cent of the communities considered had inaugurated a system of municipal removal. The number of collections of garbage per week varies from one to six, most cities reporting two or three with more frequent visits to hotels and large apartment houses. In the southern cities daily collections are common; and this practice should be more general. Dr. Chapin has well said that "the most urgent improvement in the management of garbage business is daily collection during the hot weather."[4]

Out of 146 municipalities, 111 report a more or less complete separation of waste materials, the garbage in particular being commonly kept distinct from ashes and combustible wastes. In contrast with European practice this tendency is marked.

With regard to ultimate disposal, almost all the cities report that ashes are dumped on land or used for filling while in a few cases they are dumped, in whole or in part, into the nearest body of water. Combustible waste is dumped on land in 74 cities, burned in 26, cremated or utilized in 19 and thrown into water in 6. The use of ashes for the filling of low lands is no doubt in most cases a satisfactory method of disposal and for the smaller cities it is probably most convenient to treat combustible wastes in the same manner or to destroy them by fire. The larger communities might, however, study with advantage the utilization plants for some time in operation in New York and Boston, where the dry refuse other than ashes is sorted over as it passes along a moving platform so that paper, metal and any other objects of value are recovered and only the worthless residue is burnt.[8]

The methods in use for the disposal of garbage vary more widely: and their relative importance is indicated in the following table. Many cities, of course, appear under two headings since the fate of the garbage of different sections is different.

TABLE II.

Method of Disposal.	Number of Cities.
Dumping on land	44
Burning in dump	9
Dumping in water	14
Ploughing in or using as fertilizer	18
Feeding to live stock	41
Cremation	27
Reduction or utilization	19
Irregular disposal by private parties	11

The most primitive methods of disposal are obviously still the most popular even in the larger American cities. Out of 147 cities reporting in regard to this point, only 46 or less than one-third have any scientific method of treatment. The relation of the size of the community to the method of treatment adopted is shown as follows:

TABLE III.

METHOD OF DISPOSAL.

Size of City.	Dumping.	Burning.	In Water.	Ploughing in.	Feeding to Stock.	Cremation.	Reduction.
Over 325,000	1	.....	.....	1	1	1	7
200,000-325,000	3	1	1	.....	.....	2	3
125,000-200,000	1	.....	1	2	3	.....	3
100,000-125,000	1	.....	1	1	4	3	2
80,000-100,000	2	.....	2	1	2	4	....
60,000-80,000	4	.....	1	3	4	4	1
50,000-60,000	7	1	.....	3	3	1	2
40,000-50,000	3	1	.....	1	3	7	....
35,000-40,000	5	3	4	3	7	2	....
30,000-35,000	8	1	.....	1	7	.....	1
25,000-30,000	9	2	4	2	7	3	....
	44	9	14	18	41	27	19

It appears that reduction methods are used only in the largest cities, that cremators are located from the most part in cities of 40,000 to 100,000 population and that disposal on land and feeding to stock obtain mainly in places of less than 50,000 inhabitants.

Roughly, we may say that of the larger American cities somewhat over a third throw their garbage into water or on waste land,

and an equal number dispose of it to farmers for fertilizer or fodder for stock. In defense of the first of these general methods but little can be said and many of the health officers who replied to our inquiries expressed their disapproval of the condition of affairs. "System is unsatisfactory and unsanitary." "System bad and most unsatisfactory. Any change would be an improvement." "In the summer months this office is busy attending to complaints of this kind," (relating to disposal of garbage). "————, along with other Mississippi River towns is still culpably polluting its waters by both sewage and garbage. I am doing what I can to hasten the day of garbage cremation and an intercepting sewer with terminal disposal in some more sanitary way."

Again as a city grows the expense of this method of disposal becomes burdensome on account of the necessary increasing length of haul. It almost always creates some nuisance and more or less permanently pollutes the soil. Hering records a case "which indicated that garbage can remain in a decomposing condition for hundreds of years, as evidenced by some excavations in the city of Rome."[7] Dumping in water is almost equally objectionable in many cases and the expense, according to Hering,[8] is much greater.

The second great method of garbage disposal, sale to farmers for use as fertilizer or feed for live stock is open to less serious objection when the garbage is fresh and the farms are properly regulated. Waste materials are more promptly removed, better cared for during the process of disposal and finally more or less thoroughly decomposed and converted into food material. Dr. Chapin claims with some justice that the nuisance arising from the feeding of garbage to swine is less than that caused by many cremation and reduction plants and that it might be entirely avoided by proper care and supervision.[4] The economic results of the system as shown by the experience of many New England cities are most promising. We have received reports of the revenue derived from the sale of garbage in certain municipalities in 1900 as follows: Brockton, $5,000; Lynn, $3,537; Lowell, $3,423; Springfield, Mass., $1,700; Taunton, Malden and Salem, $900 each. In Worcester, the receipts from a piggery operated by the city were $11,947. In St. Paul, 50 cents a ton is received for the raw garbage. Dr. Chapin gives similar figures in the paper quoted and cites a number of instances in which the total expense to the city for the collection and disposal of garbage by this method is less than the cost of collection alone.

For all the largest cities and for many smaller ones, these primitive methods will not indefinitely serve; and the last twenty years have seen remarkable progress in the development of disposal plants

since Capt. Reilley, U. S. A., designed the first cremator for the treatment of the refuse from the fort on Governor's Island, New York, in 1885.[9] American enterprise has given us two general types of disposal, the reduction plant which utilizes the garbage by the extraction of grease and fertilizer stock and the cremator with a single large chamber and a horizontal garbage grate which aims simply at the quick destruction of the waste materials. The latter form of furnace like the utilization plant, is confined to this country since abroad the cellular cremator with sloping grates is universal.

The incinerator of the former type is the commonest form of disposal plant in the United States. Twenty-seven cities reported to us the existence of the cremation system, and Hering, whose investigation covered many of the smaller cities, recorded forty-two.

As regards the pattern of furnace in the larger cities, it appears that the Dixon is in use in nine localities, the Engle in six, the Smith in three, the Davis in two and the Brownlee, Decarie, Lister, McKay, Thackeray and Vivarttas, each in one In all the cities of which we have record, the cremators are operated by the municipality with the exception of Atlanta, San Francisco and Waterbury.

For a description of these various types of furnace Chapin[2] or Locke and Taylor[15] may be consulted.

The Dixon furnace was in use in 1902 at Bridgeport, Camden, Fort Wayne, Jackson, Joliet, Memphis, McKeesport, Wilmington and Youngstown. Bridgeport abandoned the cremator in that year since the cost of burning had risen from an original value of 35 cents a ton to 80 cents with increased cost of coal and labor and made a new contract at 50 cents a ton for reduction with the Connecticut Abattoir and Oil Company. Fort Wayne reports an expenditure of $3,431 for the consumption of 7,000 tons of garbage, Joliet one of $1,300 for burning 1,920 tons and McKeesport one of $1,539 for a quantity not measured. At Youngstown, 7,000 wagon loads are burned with 100 tons of coal per annum, one man being employed to care for the furnace at a salary of $780. A Dixon furnace burned a portion of the garbage of York up to 1900 at a cost of $0.80 to $0.90 a ton.

The Engle cremator was installed at Evansville, Grand Rapids, Milwaukee, Norfolk, Portland and Richmond. The Milwaukee furnace cost $42,000 to consume 37,500 tons of garbage, "without causing complaints," while at Portland, $4,742 was paid for the treatment of an amount not stated. It will be remembered that this type of incinerator was the one which operated so successfully in disposing of the refuse of the Chicago Exposition in 1903.[10]

The M. V. Smith cremator was in use at Atlantic City, Waterbury and Wheeling; at Waterbury, the total cost of collection and dis-

posal was $16,000. The Davis type of furnace at Trenton cost $18,000 for the treatment of 10,500 tons of garbage and at Lancaster where this same incinerator is in use $7,710 is paid for the collection and disposal of 3,675 tons. No nuisance has been caused at either place. A Davis cremator at Havana is said to have given excellent results at a cost of 36.3 cents for fuel and 79.7 cents for labor per ton of garbage.[11].

The Decarie plant at Minneapolis more nearly resembles the European models, providing for the drying of the garbage on the sloping tubes of a tubular boiler before it is burned.[12] It treated in 1902, 12,400 tons of garbage at a cost of $6,790 and without sanitary difficulties. The Brownlee furnace at Terre Haute cost $2,514 to operate and the McKay cremator at Yonkers[13] $4,500, the latter treating approximately 6,000 tons of garbage.

The San Francisco incinerator is of special interest, because, except that at Montreal, it is the only representative in America of the type of furnace with numerous small cells fitted with sloping grate bars, which are almost universal in Germany and England and are used not for garbage alone but for unseparated refuse. The San Francisco plant is operated by the Sanitary Reduction Works under a fifty years' franchise which grants the company the exclusive right to burn refuse and to charge not more than 20 cents per cubic yard therefore. Two per cent of the gross receipts of the company are paid over to the city, amounting in 1901, to $790.93, while the city pays for the treatment of the garbage of schools, jails, hospitals and other public institutions. The plant in use is composed of 32 cells which discharge by a 9-foot flue into a 15-foot chimney, 275 feet high.

Some 200 tons of mixed refuse are treated daily, an equal amount which should be delivered to the company, being, it is said, dumped by private parties on empty lots in violation of the law. The plant has been in operation about six years and there have been a few complaints of the "smoke coming from the chimney in damp weather"; which it is hoped to obviate in the future by turning the gases back over the fire. No market has yet been found for clinker and unburnt material.

The Montreal plant, so well described at the last meeting of this Association[14], is of the same type and under municipal operation, disposes of the mixed refuse of one section of the city at a cost of 93½ cents per ton, (13,659 tons incinerated in 1901 for $12,778) but Dr. Pelletier believes that if it were worked to its fullest capacity the expense need not be over 39 cents a ton. Certainly the former rate is extremely high considering the character of the material and the fact that, except in the winter months, no fuel is required except that contained in the refuse.

It is difficult to make any comparison of the cost of garbage disposal in different communities. Per capita rates are wholly misleading on account of the varying thoroughness with which waste materials are collected and the failure to treat more than a small fraction of the total amount collected in many cities. On the other hand, the amount of garbage actually handled is often not recorded or is recorded inaccurately. For a few communities we have been able to calculate the cost per ton of disposal by cremation with some approach to accuracy and we have added some of Dr. Chapin's figures[2], (indicated by a star), that they may be compared.

TABLE IV.

COST OF DISPOSAL OF GARBAGE BY CREMATION IN AMERICAN CITIES.

City.	Type of Furnace.	Cost per Ton.
Lowell*	Engle	$1.05–2.19
Lancaster	Davis	2.10
Trenton	Davis	1.71
Milwaukee	Engle	1.12
Jacksonville*	Dixon	1.08
Camden*	Dixon	.73–1.00
Atlantic City*	Smith	.99
Muncie*	Smith	.90
York	Dixon	.80– .90
Dayton*	Dixon	.80
Bridgeport	Dixon	.35– .80
Yonkers	McKay	.75
Joliet	Dixon	.67
Portland*	Engle	.60
Richmond*	Engle	.60
Wilmington*	Dixon	.60
Minneapolis	Decarie	.55
Terre Haute*	Brownlee	.50
Fort Wayne	Dixon	.49
Atlanta*	Dixon	.34
Allegheny*	Rider	.25

Ordinarily, then, we may say that the cost of cremating raw garbage by the American method ranges from $0.50 to $1.00 per ton, these figures probably in no case including any allowance for interest or sinking fund.

In the largest cities of the United States, the peculiarly American process of garbage reduction, has become almost universal, seven out of eleven cities with populations over 325,000 having plants of this type in 1902, Baltimore being added to the list in 1903. In all cases grease and fertilizer stock are the two saleable products which it is attempted to recover; and the various utilization works may be divided into two general classes, those in which the grease is ex-

tracted by steam alone and those in which naphtha is used for the purpose[15]. The Arnold, Chamberlain and Holthaus plants belong to the first class, the Merz and Simonin, to the second. Other differences affect only minor details of operation, the extraction of the grease, and the pressing, drying and grinding of the solid residue or tankage being the fundamental processes which are always similar in principle. Reduction plants must almost of necessity be operated by private companies under contract with the city.

The Arnold companies have secured control of garbage disposal in some of the largest cities and theirs is to-day the process most in evidence. In Boston, New York, Philadelphia and Washington this system has been for some time in operation; Erie and Utica report similar plants, and a letter from Reading states that an "Arnold-Edgerton" plant was to be erected there in the spring of 1903.

The Boston plant, as originally built, contained some special features of interest in the shape of auxiliary apparatus for extracting ammonia and other valuable products from the tankage[16], [17]. When, however, this part of the works was destroyed by fire in 1899, it was not thought worth while to rebuild it so that one may conclude it did not prove exceptionally profitable. The bonus paid by the city to the reduction company is $47,400. In 1900, 75,000 tons of garbage were treated (estimate of Deputy Supt., Street Department), making the price 60 cents per ton. In New York the contract price, for the borough of Manhattan, as given by Dr. Soper[18], was $189,990, prior to 1901 and $232,000 since that date. Dr. Chapin[2] gives the amount of garbage collected in Manhattan as 152,000 tons in 1898 and 151,000 in 1899, and Dr. Soper states that the quantity has not increased materially. On this basis the cost of disposal would be about $1.25 per ton on the old contract and $1,55 on the new. Craven[19] places the amount for 1898 at 170,000 tons which would make the price in that year $1.10. The present contract price for Brooklyn is $47,990 and the amount handled on the basis of recorded figures is probably not much over 100,000 tons. It would be safe to say that the cost to the whole city is now over $1.50 a ton although the estimate of 1,500 tons per day, furnished to us by the contractor, would make it only sixty-two cents. In Philadelphia and Washington contracts cover both collection and disposal, the former city paying $398,000 for the removal and treatment of some 200,000 tons of garbage. In Washington[20] the company receives $51,600 a year for collection and disposal, paying a rebate of 50 cents a ton on all garbage in excess of 20,000 tons. In 1900 no such rebate was paid but in 1901 the city received $4,000. The only other Arnold plant for which we have figures is that at Utica where $6,500 per annum is paid for the treatment. Complaints

of nuisance from reduction works of this type have been numerous, particularly in New York, Philadelphia and Boston. In the latter city, after much political agitation and strenuous activity on the part of the board of health culminating in legal proceedings, the reduction company has just been compelled to move its plant from its old situation to one of the islands in the harbor. Washington has attempted to forestall similar difficulties by locating its works 30 miles from the city.

The Chamberlain process in operation at Cincinnati, Cleveland, Columbus, Detroit and Indianapolis is said not to differ widely from the Arnold. In 1900, according to our returns, the contract price paid in these cities for collection and disposal was as follows: Cleveland, $69,400; Columbus, $15,800; Detroit, $51,500; Indianapolis, $45,000. Dr. Chapin gives the cost of disposal alone at $0.69 per ton for Indianapolis. The Simonin process, long ago abandoned at Providence and New Orleans, was in 1902 given up at Cincinnati as well and a new contract signed with a Chamberlain company. The Simonin contract price was $26,000 for disposal alone and according to Dr. Stanton[22] the financial failure of the process was largely due to the fact that only a small portion of the garbage of the city was delivered to the company. Under the new system $76,000 is paid for collection and disposal.

The Holthaus plant at Syracuse is of the same general type as the Arnold but has provision for keeping the garbage in tightly closed receptacles during the whole process of treatment. It is perhaps the least offensive of reduction works, but the cost of treatment is high, $26,000, or $2.16 per ton according to Dr. Chapin's estimate.

Of the systems using naphtha for the extraction of grease from garbage, the Merz has been most actively developed, having been installed at Buffalo, Paterson, Pittsburg and St. Louis. The Buffalo plant [21] has been in operation for nearly fifteen years and in 1902 was treating 36,000 tons of garbage for a contract price of $15,840, according to the Commissioner of Public Works, without complaints of nuisance. In St. Louis, $65,500 was paid in 1900 for the treatment of some 70,000 tons of garbage. In 1901 a new three-year contract for $130,000 a year went into force. The assistant Health Commissioner states that the increased price is due to the fact that a three-year contract only was made in the hope of finding meantime some cheaper method of disposal. Pittsburg pays $93,890 and Paterson, $30,000, in both cases for collection and removal together.

The exact nature of the utilization plant in the other two cities, New Bedford and York, has not been reported. The former city pays $15,000 for the collection and disposal of garbage. At York the

Dixon cremator operated in 1900 had not sufficient capacity to dispose of the 3,000-4,000 tons of garbage collected and so a new contract was made with a "phosphate works" at 80 cents per ton.

The cost of disposal, in those instances where it is possible to estimate it, may be summarized as follows:

TABLE V.

COST OF DISPOSAL OF GARBAGE BY REDUCTION.

City.	Type of Furnace.	Cost per Ton.
Syracuse*	Holthaus	$2.16
St. Louis	Merz	.93–1.86**
New York	Arnold	.62-1.50°
York	———	.80
Indianapolis*	Chamberlain	.69
Boston	Arnold	.60
Buffalo	Merz	.44

* From Chapin.
** Earlier and later contract.
° According to varying estimates of amount of garbage treated.

On the whole it appears that the bonus paid to a reduction company is never much less than the amount required to operate a city cremator of the American pattern, without allowance for first cost, and, as in the case of Syracuse and St. Louis, may be a great deal more. Economically considered, the two systems are fairly well balanced as far as the municipality is concerned. Several subsidiary considerations, however, militate against the success of the reduction system. The necessity for operation by a private company under contract introduces possibilities of corrupt bargaining absent from the simple maintenance of a public cremator. The danger of breakdowns in complicated machinery menaces the regular operation of the reduction plant and the changes in the market price of the products recovered threatens its economic stability. Finally, the production of offensive odors has so far proved an inseparable concomitant of the utilization process. The necessary storage and handling of the raw garbage, in the stale and decomposing condition in which it reaches the plant, produces an offensive odor of putrefaction; and the steamed or otherwise treated garbage always gives rise to that peculiar, aromatic smell of carbonization known as the "caramel" odor. It is unnecessary to cite examples of the endless trouble these processes have caused to boards of health. We need only quote Colonel Morse to the effect that "it has been found impracticable to conduct the works so that a nuisance would be wholly prevented[23]." and Dr. Durgin's pithy comparison of the reduction and cremation systems, "the one is a nuisance and the other not always a nuisance"[24].

As the Zurich investigators concluded, "from a sanitary point of view, cremation is the only correct method of disposal"[8].

Furthermore, it is probable that cremation, as practiced abroad is cheaper than either reduction or cremation as carried out in this country. The main difference lies in the fact that instead of carting away ashes at considerable expense, the English and German authorities utilize these half-burnt materials to aid the combustion of the garbage. Goodrich expresses naive astonishment at our habits. "What folly it is to actually pay for throwing away enormous quantities of the most useful part of the refuse." "It is really difficult to associate our ingenious friends with such wasteful methods."[3]. For the destruction of mixed refuse, the English use as we have said, a furnace differing from ours in its cellular character, its sloping grate bars for preliminary drying of the material, and in many cases in being provided with forced draught. The principal types of destructors, (the Horsfall, the Fryer, the Beaman and Deas, the Warner), as described by Hering, in Hamburg and Berlin[25] and by Maxwell in the English cities[26] all show much similarity in their general plan. All have been operated with perfect sanitary success; and all prevent the nusiance caused by the dumping of refuse other than garbage which defaces some of the most beautiful suburbs of American cities. The cost per ton as given by Maxwell varies from sixpence at Bradford to two shillings and tenpence at Battersea and averages one shilling and three halfpence. Garrett[27], gives the following figures — Horsfall, at Edinburgh, one shilling and sevenpence, at Oldham, sevenpence, at Bradford, sixpence,— Beaman and Deas, at Leyton and Dewsbury, one shilling and fivepence,— Fryer, at Liverpool, one shilling, at Bournemouth, elevenpence,— Warner, at Torquay, sixpence to ninepence.

It is impossible accurately to compare these figures with those for American plants since the tons of refuse treated in England include ashes and combustible waste and the cost of disposal of these substances is in most of our cities confused with the expense of collection. Nevertheless, it seems probable that on the whole the English system is the cheaper one. When well managed, as at Shoreditch, the dry refuse furnishes not only enough fuel to burn the garbage but an excess, which in this case is the principal source of power for a municipal lighting plant; and in some places the clinker produced finds a marker for the making of mortar or for road beds. The experience of the last few years has in our judgment only confirmed the conclusions of the committee on the "Disposal of Garbage and Refuse,"[2], that separation of waste materials is neither economical nor desirable, that the cremation of mixed refuse appears to be the most generally satis-

factory process and that this cremation may be best accomplished in furnaces of the English type.

In conclusion we wish to express our thanks to Prof. W. T. Sedgwick and Prof. Dwight Porter of the Massachusetts Institute for Technology, for advice and assistance in the execution of this study.

REFERENCES.

1. Hering, R. Report of the Committee on the Disposal of Garbage and Refuse. Transactions of the American Public Health Association for 1897. XXIII, p. 206.
2. Chapin, C. V. Municipal Sanitation in the United States. Providence. 1901.
3. Goodrich, W .E. The Economic Disposal of Towns' Refuse. London. 1901.
4. Chapin, C. V. The Collection and Disposal of Garbage in Providence, R. I. Transactions of the American Public Health Association for 1902. XXVIII, p. 46.
5. The Utilization of City Refuse in Boston, Mass. Engineering Record. XXXIX, 1899, p. 277.
6. Baker, M. N. The Municipal Year Book for 1902, p. XIX.
7. Hering, R. Report of the Committee on the Disposal of Garbage and Refuse. Transactions of the American Public Health Association for 1894. XX, p. 196.
8. Hering, R. Report of the Committee on the Disposal of Garbage and Refuse. Transactions of the American Public Health Association for 1896. XXII, p. 105.
9. Kilvington, S. S. Garbage Furnaces and the Destruction of Organic Matter by Fire. Transactions of the American Public Health Association for 1888. XIV, p. 156.
10. Morse, W. F. The Disposal of the Garbage and Waste of the World's Columbian Exposition. Transactions of the American Public Health Association for 1893. XIX, p. 53.
11. The Renovation of Havana. Engineering Record, XLIII, 1901, p. 74.
12. The Decarie Garbage Crematory at Minneapolis. Engineering Record. XLIV, 1901, p. 318.
13. The McKay Garbage Cremator. Engineering Record. XXXI, 1894, p. 57.
14. Pelletier, E. Refuse Disposal in Montreal. Transactions of the American Public Health Association for 1902. XXVIII, p. 29.
15. Locke, W. W. and Taylor, J. B. Refuse Disposal of Cities. Report of the Brooklyn Health Department for 1896.
16. The Garbage Reduction Plant at Boston, Mass. Engineering Record. XLIV, 1901, p. 251.
17. Hill, H. W. Refuse Disposal in Boston. Transactions of the American Public Health Association for 1901. XXVII, p. 186.
18. Soper, G. A. Report on the Disposal of the Refuse of New York City. Transactions of the American Public Health Association for 1902. XXVIII, p. 64.
19. Craven, MacDonough. Waste Disposal and its Advances. Transactions of the American Public Health Association for 1899. XXV, p. 293.

20. Woodward, W. C. Refuse Disposal in the District of Columbia, Transactions of the American Public Health Association for 1901. XXVII, p. 194.
21. Landreth, O. H. Disposal of Refuse in the City of Buffalo. Transactions of the American Public Health Association for 1902. XXVIII, p. 51.
22. Stanton, B. Report upon the Disposal of Refuse Materials in Cincinnati, Ohio. Transactions of the American Public Health Association for 1902. XXVIII, p. 59.
23. Morse, W. F. The next step in the Work of Refuse and Garbage Disposal. Transactions of the American Public Health Association for 1899. XXV, p. 312.
24. Durgin, S. H. Discussion on Garbage Disposal. Transactions of the American Public Health Association for 1901. XXVII, p. 358.
25. Hering, R. The Disposal of Garbage and Refuse. Engineering Record, XXVI, 1897, pp. 446-532.
26. Maxwell, W. H. The Removal and Disposal of Town Refuse. London. 1898.
27. Garrett, H A. Refuse Disposal, and the Results obtained from a six-months' working of the Refuse Destructors at Torquay. Proc. Inst. Mech. Eng., 1899, p. 419.

NOTES TO TABLE I.

Albany.	According to Chapin, (2).
Allentown.	Dixon cremator to be built.
Baltimore.	Reduction plant now in operation.
Butte.	According to Baker, (6).
Canton.	Dixon cremator in process of construction.
Des Moines.	According to Baker, (6).
Houston.	Cremator not in use.
Louisville.	Experimental Dixon furnace in operation.
Lowell.	Cremator abandoned.
New Castle.	Cremator in process of construction.
Oshkosh.	According to Chapin, (2).
Pueblo.	According to Chapin, (2).
Reading.	Arnold-Edgerton plant to be constructed.
Saginaw.	Plan for cremator under consideration.
Salt Lake City.	City cremator being rebuilt after destruction by fire.
Seattle.	Plan for disposal under consideration.
South Bend.	New cremator under consideration.
Spokane.	Agitation for cremator which will probably soon be built.
Topeka.	According to Baker, (6).
Troy.	Dixon furnace abandoned.

SUMMARY OF TABLE I.

Cities in which disposal of garbage is by dumping on land.

Auburn, N. Y.
Bayonne, N. J.
Birmingham, Ala.
Cedar Rapids, Iowa.
Charleston, S. C.
Chicago, Ill.
Council Bluffs, Iowa.
Dayton, Ohio.
Duluth, Minn.
Elizabeth, N. J.
Elmira, N. Y.
Fort Worth, Texas.
Galveston, Texas.
Hartford, Conn.

Harrisburg, Penn.
Hoboken, N. J.
Houston, Texas.
Jersey City, N. J.
Knoxville, Tenn.
Lincoln, Neb.
Louisville, Ky.
Mobile, Ala.
Montgomery, Ala.
Newark, N. J.
New Britain, Conn.
Newport, Ky.
Oakland, Calif.
Omaha, Neb.
Passaic, N. J.
Peoria, Ill.
Reading, Pa.
Rockford, Ill.
Sacramento, Calif.
Saginaw, Mich.
Salt Lake City, Utah.
Schenectady, N. Y.
Seattle, Wash.
Sioux City, Iowa.
South Bend, Ind.
Springfield, Ill.
Superior, Wis.
Toledo, Ohio.
Troy, N. Y.
Williamsport, Pa.

Cities in which garbage is burned on dumps.

Augusta, Ga.
Chattanooga, Tenn.
Covington, Ky.
Honolulu, H. I.
Joplin, Mo.
Minneapolis, Minn.
New Castle, Pa.
San Antonio, Texas.
Tacoma, Wash.

Cities in which garbage is dumped into water.

Dayton, Ohio.
Davenport, Iowa.
Dubuque, Iowa.
Easton, Pa.
Honolulu, H. I.
Kansas City, Mo.
Lacrosse, Wis.
Lynn, Mass.
Nashville, Tenn.
New Orleans, La.
Newport, Ky.
St. Joseph, Mo.
South Omaha, Neb.
Spokane, Wash.

Cities in which garbage is ploughed in or used as fertilizer.

Allentown, Pa.
Baltimore, Md.
Bay City, Mich.
Binghamton, N. Y.
Cambridge, Mass.
Erie, Pa.
Holyoke, Mass.
Jackson, Mich.
Lynn, Mass.
Malden, Mass.
Manchester, N. H.
New Haven, Conn.
Rochester, N. Y.
St. Paul, Minn.
Savannah, Ga.
Somerville, Mass.
Springfield, Mass.
Springfield, Ohio.

Cities in which garbage is fed to live stock.

Baltimore, Md.
Bay City, Mich.
Brockton, Mass.
Cambridge, Mass.
Cedar Rapids, Iowa.
Chelsea, Mass.
Denver, Colo.
Erie, Pa.
Fall River, Mass.
Fitchburg, Mass.
Gloucester, Mass.
Haverhill, Mass.

Holyoke, Mass.
Jackson, Mich.
Johnstown, Pa.
Joplin, Mo.
Lawrence, Mass.
Lowell, Mass.
Lynn, Mass.
Malden, Mass.
Manchester, N. H.
New Britain, Conn.
New Haven, Conn.
Newton, Mass.
Omaha, Neb.
Pawtucket, R. I.
Portland, Me.
Providence, R. I.
Quincy, Ill.
Rockford, Ill.
Sacramento, Calif.
Saginaw, Mich.
St. Paul, Minn.
Salem, Mass.
Somerville, Mass.
Spokane, Wash.
Springfield, Mass.
Springfield, Ohio.
Superior, Wis.
Taunton, Mass.
Worcester, Mass.

Cities in which garbage is cremated.

Atlanta, Ga.
Atlantic City, N. J.
Bridgeport, Conn.
Camden, N. J.
Dallas, Texas.
Evansville, Ind.
Fort Wayne, Ind.
Grand Rapids, Mich.
Jacksonville, Fla.
Joliet, Ill.
Lancaster, Pa.
Los Angeles, Calif.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Norfolk, Va.
Portland, Ore.
Richmond, Va.
San Francisco, Calif.
Scranton, Pa.
Terre Haute, Ind.
Trenton, N. J.
Waterbury, Conn.
Wheeling, W. Va.
Wilmington, Del.
Yonkers, N. Y.
Youngstown, Ohio.

Cities in which garbage is reduced.

Allegheny, Pa.
Boston, Mass.
Buffalo, N. Y.
Cincinnati, Ohio.
Cleveland, Ohio.
Columbus, Ohio.
Detroit, Mich.
Erie, Pa.
Indianapolis, Ind.
New Bedford, Mass.
New York, N. Y.
Paterson, N. J.
Philadelphia, Pa.
Pittsburg, Pa.
St. Louis, Mo.
Syracuse, N. Y.
Utica, N. Y.
Washington, D. C.
York, Pa.

Cities in which garbage disposal is by various primitive methods.

Akron, Ohio.
Albany, N. Y.
Altoona, N. Y.
Chelsea, Mass.
East St. Louis, Ill.
Lexington, Ky.
Pueblo, Colo.
Racine, Wis.
Topeka, Kansas.
Wilkesbarre, Pa.
Woonsocket, R. I.

REPORT OF THE COMMITTEE ON DISPOSAL OF INDUSTRIAL WASTES.

By Dr. GARDNER T. SWARTS, Chairman, Providence, R. I.

Your committee desires to report that owing to the large field over which this subject extends it is impracticable to present a complete report at this time. The question of the disposal of industrial wastes is one which is a most serious and annoying problem to all boards of health in manufacturing districts. The pollution of streams is the natural sequence of the introduction of the many industries.

The demand of a given manufactory that their wastes be disposed of without creating a nuisance would, in many instances, be equal to the demand that they discontinue business inasmuch as the cost of disposal of these wastes, in a satisfactory manner, would be to prohibit the financial success of the industry. There are many cases, however, where it is within the bounds of economical operation to dispose of wastes which at present are discharged into streams simply because no demand has been made for the perfection of such action.

As has been shown at the experiment station of the Massachusetts State Board of Health, and especially by experiments made in England, as well as what has been done by many private corporations, very much can be accomplished which at first would seem to be impracticable, and it is the desire of this committee to place before the Association such experience and measures as have been shown to be of practical application in many industries. As an illustration of the vastness of this field of investigation it may be stated that there are certainly one hundred different forms of industries which produce wastes which make themselves objectionable if not properly cared for.

Each one of these industries requires distinct and individual consideration and while no specific plans can be given for each individual plant yet there are certain general principles which govern the disposal of these wastes in separate forms of industry which would serve as a basis for determining the requirements in individual cases.

That your committee may be enabled to present the accumulation of data upon this subject, and present it in proper form, it would respectfully ask for a continuance of its appointment for another year.

REPORT OF THE COMMITTEE ON CAR SANITATION.

By GRANVILLE P. CONN, M. D., Chairman, Concord, N. H.

Your committee on car sanitation respectfully report that while we are not prepared to suggest reforms that would at once settle this much vexed question, yet, we believe progress is being made, and the managers of our railroads are coming more nearly in accord with public opinion, and that the problem is gradually being solved.

In car sanitation many obstacles are to be overcome, that are not necessarily given much thought when considering the question of the hygiene of a dwelling. The house on wheels not only has the atmospheric influences as at all times surround the dwelling, but at different rates of speed, this pressure is immensely greater than that upon the ordinary domicile. We must always take into consideration the character of the occupants, who for the time being are tenants having but little or no thought of the sanitation or well-being of those who may be the next passengers to occupy the same seats, and who perhaps have little or no appreciation of what an expert in sanitation would consider a healthy condition of personal cleanliness or of a habitation. All such matters must receive attention when the problem of car sanitation is being considered, and the standard of excellency which the public might desire should always be kept in mind and the conditions made as nearly the standard as possible.

As the atmospheric pressure is constantly changing according to the rate of speed, the conditions of ventilation are also changing according to whether the train is running ten or sixty miles an hour. The ventilation system of cars at the present time does not seem to take this into consideration, as the transoms and other means of ventilation are the same all over the cars. It is true that as more air will be forced into a car at sixty miles an hour than at ten, less of the transoms need be opened at certain seasons for a fast train than for a slow one, yet until trainmen are educated in this as in other matters of car sanitation they will probably continue their work as it is done now, of opening all the transoms or closing them all or be governed by the whim of some particular passenger.

The matter of heating and ventilation of cars seems to disturb all the theories and plans of architects and designers, although there is considerable evidence that car builders are taking up this question and I believe will ultimately solve it so as to promote the health and comfort of passengers.

Many years since railway companies and car builders spent no inconsiderable amount of money in experimenting with the theories and plans of architects, and others, who believed they had designs that would solve this question. As the most of these designs were the theories of men who had but little mechanical skill, the most of them proved expensive features, and for a time the question of car sanitation seemed to drift along without any improvements. At the present time the mechanical genius of those who design and construct cars is being turned in this direction, and considerable improvements have been made in the heating and ventilating system of our trains. It remains, however, to educate the trainmen in the use of all improvements, and in all such matters it is necessary for some one to understand the first principles of the design, as well as attending to the mechanical part so as to accomplish what was originally intended.

There is a marked difference of opinion among railroad managers, as well as with sanitarians, on questions of this nature, and it is well to bear in mind when discussing car sanitation, that primarily railways are constructed for the purposes of passenger and freight traffic, capable of earning a revenue sufficient to pay the stockholders a dividend. I do not know as a charter was ever issued that made any reference to what should be considered a sanitary standard for the health of passengers, therefore the problem we are about to discuss is entirely one of public opinion, and one which is suggested for the comfort and well-being of all classes of those who travel for business or pleasure rather than a commercial question.

That there is now and then one who does not believe the profession or the public can suggest anything to the management of railroads worthy of notice is occasionally in evidence, and may be found in a quotation from a letter to the *Railway Surgeon*, from Alfred Foster of Wilmington, N. C. He said:

"To the Editors:

"One of the most striking tendencies of modern times is the minute specialization of the different branches of one business, and in no profession have the changes been more rapid than in the management of railroads. This tendency to specialization has been so radical in the railroad business that it has brought about changes that might be termed revolutionary, and abuses have crept in as one of the sequences of such rapid growth.

"On a great many systems of railroads each department is under the direction of an expert in his particular line, but who has received little or no training in any other line. Consequently he is more than apt to view all questions from the standpoint of his department, to the complete exclusion of all others. These department experts being usually men of technical education rather than commercial, they are prone to lose sight of the sole reason for which railroads are conducted

as private enterprises, viz, for the greatest profit that their owners can secure from them.

"When it is brought down to its last analysis, a railroad company is simply a commercial concern engaged in the selling of transportation. As such it is not bound to do anything more for the community, its patrons or employes than any other large taxpayer and good citizen, engaged in other commercial pursuits."

There can be no doubt that Mr. Foster represents the commercial side of the question, and in so doing has but little or no sympathy with those who pay their money for transportation, beyond the fact that each dollar becomes a factor in paying fixed charges and a dividend.

Dr. H. M. Bracken, Secretary and Executive Officer, Minnesota State Board of Health, in a paper before the annual meeting of the American Academy of Railway Surgeons, having had a conference with the chief surgeon of an important railway, gave the following to show that there was a difference of opinion in regard to railway sanitation even among members of the profession. He said:

"At the conference with this chief surgeon, certain lines, along which sanitary observations might be made to the advantage of both the company and the public, were suggested. To these suggestions the chief surgeon replied somewhat as follows:

"There is no need of special sanitary advice in connection with the railroad work, because:

"First, railway coaches are built along lines laid down by the Builders' Union and the companies can do nothing towards improving their construction. (No reference made to their care in this argument.)

"Second, sleeping cars are almost universally of the Pullman type and are modeled along the most approved sanitary lines. The railway companies cannot improve upon these plans.

"Third, depots are built under the same sanitary regulations (local) as those which govern the construction of other houses in villages and cities."

Dr. Bracken further says:

"My intentions toward the railway companies in this matter are most kindly. Complaints are constantly coming to me, as a sanitary official bearing upon railway sanitary problems. I have always found the railway officials in Minnesota ready to remove cause for complaint when their attention was drawn to the matter. I am under the impression that if railway officials are made familiar with railway conditions, which are likely to give rise to complaint, they will prefer correcting these conditions before a complaint is made, thus avoiding the friction which so often accompanies a complaint made by a local board of health, or by a village or city council.

"In private life it is better to keep our houses and surroundings in such sanitary condition as not to annoy our neighbors. The same is true, I think, of railways and I have every reason to believe that the officials of such corporations appreciate this fact."

Dr. Bracken then gave some of the more common causes of complaints from the public and says these complaints have grown less frequent during the past two or three years.

"The occasions for complaints in the past were due chiefly to one or all of the five following causes:

1. The danger of infection from communicable diseases of animals.
2. Improper construction of pens, especially as to the flooring.
3. Too long intervals without cleaning.
4. The constant use of the pens for feeding purposes by shippers.
5. The noise attendant upon the collecting and loading of stock at these pens."

In commenting he said:

"My own experience in dealing with these matters has been that railway officials have as a rule complied with any reasonable sanitary requirements bearing upon the first three points.

"The fourth point is one that local health officers and shippers are often responsible for, rather than the railways. Shipping pens should not be used as constant feeding pens. The railways do not wish them to be used for such purpose; but often they cannot easily prohibit it without offending their customers. It is for the municipal sanitary authorities to regulate such matters. Generally the shipper is violating the rules of the railroad men when he uses their shipping pens for feeding, for often, if not invariably, the company's regulations state that cattle, etc., must not be kept in the shipping pens over twenty-four hours.

"The fifth point is often a difficult one to correct. It is apt to give cause for complaint in places where the pens have first been located at some unobjectionable point, around or near which buildings have been erected later. It sometimes even happens that a piece of property, lying contiguous to shipping pens and looked upon as undesirable because of its location, is bought at a low figure and thereupon the purchaser, with a wish to enhance its value, immediately sets about to complain that the shipping pens injure his property. If he can secure the support of the local sanitary or municipal authorities, he will undertake to force the railway authorities to remove the shipping pens to some other point, even though the expense of so doing may be considerable. This is in many instances an injustice to the railway. It happens at times that the growth of a place naturally encroaches upon shipping pens. Under such circumstances, it may become necessary to request or even demand the removal of the pens. But then it should not be a difficult matter to bring about the desired change, for the parties concerned should deal with this as a business proposition and should easily reach an amicable settlement."

In regard to railway stations, Dr. Bracken says:

"Two points are open to consideration as pertaining to railway stations:

1. Proper construction.
2. Proper care.

"If a station is built without any regard to sanitary requirements, it will never be a decent place to wait in, even though the care of the

place may be of the best. If a station is well built, but poorly cared for, it is an unattractive place. If it is well built and well cared for, much of the annoyance of waiting for trains is removed. In this, as in many other business affairs, it need cost no more to exercise a fair amount of intelligence in the construction and care of railway stations than it will to follow the reverse course."

In this connection your committee would suggest that the sanitation of stations or cars is no small matter, neither can it be considered automatic. There must be at every station and at the head of every car cleaning department some one sufficiently versed in sanitation as to have a proper regard for personal comfort and cleanliness, who shall be held accountable for the hygienic conditions under his supervision. When that is done and it becomes well understood, that if his duties are not performed to the satisfaction of the management and the public, a vacancy will be found and the former incumbent will be looking for a new place, there will be an incentive for employes to inform themselves of what constitutes sanitation in order to accept positions requiring ability.

Referring to the second proposition of the chief surgeon that "sleeping cars are almost universally of the Pullman type and modeled along the most approved sanitary lines," Dr. Bracken said:

"The statement that these are almost universally of the Pullman type and are modeled along the most approved sanitary lines is not founded upon facts. I venture to say that there is nothing connected with railway travel which is as much in need of sanitary investigation at the present time as the ordinary sleeping car. I venture to say that as a sanitary problem there has been no improvement in the last twenty years so far as the Pullman sleeping car is concerned."

"If you ask a porter how frequently the berths are aired, he will probably tell you — 'at the end of each trip.' He may inform you that the blankets and bedding are taken out of the car and placed under a shed where they can be properly cleaned; that the car is then thoroughly cleaned; that everything is fresh and clean for the next trip. If you ask a sleeping car superintendent as to how the company's cars are cared for, he may give you an elaborate set of rules and regulations. In spite of these employes' words, our own sense of sight and smell will tell you that the porter has been lying, and a little investigation will prove to you that if the sleeping car company had any rules and regulations governing the proper care of cars, these are only meant for the credulous traveling public and are never enforced. If we investigate the toilet closet of the sleeping car, we will not find evidences of marked sanitary improvement. True, the pattern of the seat and bowl has been changed, but the same stuffy room, the same lack of ventilation, the same foul odors, the same inconvenience at railway stations, are there."

* * * *

"So far as the cars are concerned, there is actually more danger of infection from the furnishings of the sleeping car than of the day coach.

"In speaking of the sleeping cars, one must not overlook the compartment sleepers. These are a great improvement, in their general construction, over the ordinary sleeper. Sanitary requirements that might easily be met in these coaches are, however, overlooked."

* * * *

"Of the day coach I shall say little.. We all know that its toilet closet is avoided by all respectable people, even to the point of marked personal discomfort; we all know that such coaches have by no means an attractive appearance after a service of a few hours, for passengers are permitted and even encouraged, by the goods hawked through the cars, to cover the floor with the remnants of lunches and fruit, in a way that would never be permitted in a hotel or private residence."

In the discussion which followed the reading of Dr. Bracken's paper, Dr. Gardner of San Francisco said:

"With regard to the ventilation of Pullman cars, it should be recognized by every railroad surgeon, because it has a bearing upon the spread of contagious diseases."

* * * *

"As to the ventilation of the berths, I look upon it as a specialty, essentially, and still it would be hardly convenient to leave the berths open after people have risen in the morning. People like to have their berths made up, and still, when the porter takes them down in the evening odors are emitted which we all recognize as characteristic of those cars. The Oakland board of health of California has suggested to all railroad companies to sterilize all cars coming in from overland trips, whether day coaches or tourists cars, and I believe with beneficial effect."

Dr. R. W. Corwin of Pueblo, Colo.:

"I have only one comment to make, and it is this: It is easy for us to criticise; it is easy for us to ask questions, but I am only sorry that the essayist has not given us a remedy; that he has not pointed out in what way we shall practically do this work. It is easy enough for us to say, it shall be done, but it is an extremely difficult thing to do that which we should like to have done economically."

Dr. Bracken in closing the discussion said:

"I have but a few words to say. I did not suggest a remedy for two reasons: First, it is a difficult problem, and one cannot offhand suggest a remedy. I have heard many, many papers on car sanitation before medical societies, and there are a great many medical men who are not distinctly interested in railroad work. I have heard many papers that were impracticable, and the only way to get down to this problem is to study it as a body, and not leave it for any one individual to dictate. I dealt with the subject in a general way for the purpose of creating general interest and eliciting a discussion. * * * The question of car ventilation is one of the most difficult we have

to deal with. House ventilation is simple, as compared with car ventilation. I am not ready to give a solution of the problem."

It is a pleasure to know that the commercial aspect of railroads and their management is not entertained to such a degree as that expressed by Mr. Foster quoted above.

A report from Dr. Dudley of the Laboratory of the Pennsylvania Railroad and of Mr. Garcelon, General Manager of the Pullman Co., is convincing evidence that the management of roads are willing to expend reasonable amounts in experimenting on plans to render more perfect the hygiene of car sanitation. Mr. Garcelon's letter shows that he relies upon local and state boards of health for information and inspection. In this connection it has recently been called to my attention that the New York, New Haven and Hartford Railroad, who have used compressed air for many years in the cleaning of cars are now experimenting with compressed air to create a vacuum rather than by direct pressure. So far, experiments show it is equally as good if not better for cleaning purposes and leaves the plush cloth of the seats in much better condition, as the nap of the cloth stands out presenting a fresh surface every time it is used instead of the matted condition under the old system of direct pressure from compressed air. This is explained in the fact that compressed air has some moisture which is driven into the cloth by direct pressure, mats down the nap of the cloth leaving it in a condition that is not fresh in appearance. The direct work done by vacuum is the reverse of this and it was reported to me that it could be done at a saving of time and expense over that of the old method. An example of this kind shows conclusively that the management of our roads are alive to public sentiment and for the comfort of the public as well as for themselves.

Mr. Garcelon, General Manager of the Pullman Company, writes your committee the following letter:

CHICAGO, August 26, 1903.

Dr. G. P. Conn, Concord, N. H.

DEAR SIR: — I duly received your letter of the 18th inst., and in reply have to advise that complaints of the nature you refer to are of rare occurrence in our service, but the importance of obviating them is fully appreciated by all the officials of our operating department; and is a matter of constant vigilance to them, and to those who have immediate charge of the operation of our cars; and there is no detail of administration to which more careful attention is given than the maintenance of proper sanitary conditions. In order that you may be fully informed as to the care we exercise in that direction I beg to say that the following general instructions have been operative for some years past:

(1) All the cars are thoroughly cleaned at the end of each trip. The upholstery, carpets and bedding are taken out of the car and the

dust is removed from the plush and carpets by means of compressed air; the mattresses and pillows are beaten and aired and the blankets are shaken and aired.

(2) The hoppers are flushed automatically each time they are used, and as a part of the process of cleaning given cars at end of each trip, the closets and all fixtures therein are thoroughly washed and disinfectant applied.

(3) If an invalid occupies a berth in one of our cars, every precaution is taken during the journey to relieve the apprehension of fellow passengers, and the bedding is removed and disinfected as soon as possible after the berth is vacated. In the event of an invalid suffering from a known infectious or contagious disease occupying a car, it is thoroughly fumigated under the direction of a local health officer, and the car is not allowed to return to service until proper permit has been issued by such officer. Cuspidors are frequently cleaned and disinfected while cars are en route.

(4) All cars running to points within regions regarded by consumptive persons as favorable resorts are closely watched and cared for, and our car service men are instructed to report to the District Superintendent at the termination of the trip, if any person suffering from consumption or other contagious or infectious disease has occupied a berth in their cars and if so, measures must be taken by the District Superintendent to immediately have such car or cars fumigated according to the approved methods now in use by the Company.

(5) In addition to the foregoing, and in order to prevent as far as possible the spread of contagion, all cars in such lines are fumigated at least once a month.

These instructions are rigidly and carefully enforced, and I may add that our process for fumigating and disinfecting a car in which a passenger suffering from consumption or other infectious disease has traveled, or cars passing through a section of the country in which a contagious epidemic may be prevailing, has proved its effectiveness. Its application is prompt and thorough, and whenever a certificate of clearance from a local or state board of health has been required, cars so treated have, without exception, passed inspection. The Department of Health of the City of Chicago has approved the process, and the instructions in use for applying it, as well as The Pullman Company's method of car disinfection as a whole.

Very truly yours,

C. A. GARCELON,
General Manager.

Dr. Dudley of the Laboratory of the Pennsylvania Railroad Company gives a resume of the work being done by the great Pennsylvania system.

ALTOONA, PA., September 9, 1903.

Dr. G. P. Conn, Chairman Com. Car Sanitation, A. P. H. A., Concord, N. H.

DEAR SIR: — Referring to yours of September 1st:. I am sorry that I shall not be able to prepare a special set paper for the meeting

of the American Public Health Association in October. I have been too much pressed with work this summer, and also have been a little bit under the weather, so that really it is impossible. On the other hand some time in November last, we criticised for our officers, the printed circular of the American Public Health Association, on "Car, Steamboat and Steamship Sanitation," prepared by Professor Woodbridge. I note that the chairmanship of the committee has changed, as I understand the matter, and that Professor Woodbridge is no longer at the head of the committee. I do not know whether our criticisms ever reached the committee at all. As they contain considerable matter from the railroad standpoint, it has occurred to me that perhaps it might be desirable to send a copy to you as chairman of the committee on "Car, Steamboat and Steamship Sanitation," which I accordingly do herewith. You will understand that the report was written to our officers, and this will explain the style. The review or criticism of this report, leaving out the headings, is as follows:

The first precaution recommends "the finishing of the interior of railway coaches with hard, plain, smooth and polished surfaces, and the disuse of mouldings, groovings or other finsh, such as furnish lodgment for dust and dirt." We see nothing to criticise in this precaution, and are inclined to think that it is a wise view of the case. We have for a long time regarded the latest built Pullman cars, which have large smooth surfaces with absence of adornment, as far superior from the sanitary point of view, to cars containing considerable carved work. Moreover it is well known that the cost of maintaining the carved work in an ordinary passenger coach is quite large. Whenever the oil finish on this carved work becomes stained or dirty and in need of renewing it becomes necessary to scrape it before the new coating is put on, and this scraping is a very expensive operation. We really cannot but recommend a careful consideration of this precaution in car construction, both from the hygienic standpoint, and also from the standpoint of economy.

The second precaution recommends "the furnishing of the interior of railway coaches with material as non-absorbent and as cleansible as practicable, applying this to the floor covering, seat and seat back upholstery, window screens, berth curtains and bedding." We are compelled to say that we are not quite able to follow this recommendation in its entirety. The idea involved, as we understand the matter, is, that non-absorbent materials may be much more readily cleaned, and that, therefore, they are much less a source of danger, than absorbent materials. We are compelled to say that we think there are two sides to this question. If a tuberculous person spits on a non-absorbent surface, and the material becomes dried on this surface, the bacteria are much more easily stirred up from their situation on the surface and disseminated through the air, than if the sputum was deposited on an absorbent surface. While it is well known that the act of drying itself, does in many cases, diminish the vitality, and in many cases causes death to certain pathogenic bacteria, we cannot help feeling that the dried material containing bacteria, on a non-absorbent surface, are more dangerous to the occupants of any space, when displaced by the ordinary operations of walking and sweeping, than if the bacteria with their accompanying material had been put

upon an absorbent surface. We are decidedly of the opinion that from the sanitary standpoint, plush is a better substance for seat backs and seat coverings than a non-absorbent substance would be. The dust laden bacteria, if such there be in a car, settle into the plush, and are more liable we think to be retained and carried to the end of the run, than if the dust had fallen on a non-absorbent surface. Furthermore, while we do not as yet know of any absorbent material for a floor covering, that is cheap enough to be burned after it has become contaminated by expectoration upon it, we are confident it is less dangerous to the occupants of a car, if the dried sputum is held in an absorbent covering, than if it is deposited on a non-absorbent surface. This is hardly the place for a long discussion on this matter, but our own opinion is that it is better to use plush and other available material for seats, floor covering, berth curtains, etc., which is more or less absorbent, and have them properly cleaned at the end of the run, than to use non-absorbent materials for this purpose. We should be very glad to discuss this matter to a finish with the advocates of non-absorbent materials, for this purpose.

The third precaution is proper ventilation of passenger, parlor and sleeping coaches under such conditions as will introduce the ventilating air and remove it, without serious draughts, a minimum of 1,000 cubic feet of air per hour for each passenger being recommended. We are very happy to say that our present standard ventilating system, we think, meets this requirement perfectly as applied to passenger coaches. There is a lamentable lack of attention to this important matter in the Pullman equipment, and we cannot but second the recommendation of the circular in this matter, as applied to parlor and sleeping coaches. We are clearly of the opinion that some action ought to be taken in regard to these two classes of coaches.

The fourth precaution applies to the proper regulation of the temperature of cars. Upon this point we will still say that much study is being put on this subject, and that it is hoped by the end of another winter, we will be able to accomplish all that is requisite upon this head. It is to be confessed that the present system of heating cars by means of steam, has not yet reached such a point of development as to be completely satisfactory.

The fifth precaution refers to the proper cleaning of coaches, at terminals, and the avoidance of cleaning while in transit, in such a way as to raise dust, going into the matter with some detail, recommending the washing of floors, the removal of the seat upholstery outside the car for cleaning, the removal of dust from fabrics by air blast or beating, and from surfaces by moistened cloths. These precautions as applied to terminal cleaning, we think worthy of some consideration, and as we understand the matter, many of the details are now our regular practice. The cleaning of cars in transit is a much more difficult matter to successfully accomplish without raising dust, and we are strongly of the opinion that any cleaning in transit that does raise dust, is very much more hazardous from the hygienic standpoint, than it would be to allow the material to remain in whatever position it may be in the car until the terminal is reached. It should be remembered we think, that a passenger coach, especially a well ventilated one, has within itself, a large measure of protection

against disease, due to the action of fresh air, dryness and sunlight. It has been demonstrated we think bacteriologically that heat, dryness and the sun kill outright a very large number of the dangerous bacteria, and those that are not killed outright, by such treatment, are rendered much less virulent by them. The question of how to do whatever cleaning is necessary in transit, without stirring up fresh bacteria which have not had a chance to be exposed to the action of fresh air, heat and sunlight, is an extremely difficult one. The matter was discussed quite at length at a recent meeting of the Committee on Conducting Transportation, in Pittsburgh, with the conclusion that the best that can be done, is perhaps to use a brush on the end of a long handle, and damp rags or a mop, if the occasion demands. If we had a floor covering that was of a disinfecting nature, and would completely absorb the objectionable material, it would be apparently the best possible treatment to allow the material to remain where it chanced to fall until the end of the run. Until such a floor covering is devised as has already been stated, which is efficient and cheap enough to be burned when it becomes contaminated, probably the best that we can do, is to follow the practice just mentioned.

The sixth precaution recommended is in regard to the disinfection of the interior of the coaches by washing the floors with disinfecting solution and dusting with cloths moistened with disinfectant including in the cleaning the sanitary fixtures and the cuspidors. As we understand the matter it is our present practice to clean the closets with disinfecting solution, and we think it would be desirable also to have the floors washed with the same disinfecting solution. Also we think the use of a cloth moistened with proper disinfecting solution, is desirable for dusting, and for those cars which have cuspidors, there is no reason why the same practice should not be employed in cleaning them. Our standard disinfectant applies charmingly to all the cases mentioned, and it is only a question of securing efficiency among the car cleaners, to completely meet the recomemndations in this precaution.

The seventh precaution in regard to excluding people with communicable disease, is an excessively difficult one to handle. As we understand the matter, we do not now carry people known to be afflicted with communicable disease of a virulent type, such as smallpox. In other words where there is no doubt about the nature of the disease, there is no difficulty in handling the matter, but for persons in the first stages of tuberculosis, or going down with diphtheria or with scarlet fever, or whooping cough, mumps, etc., where there is a reasonable question as to the diagnosis, it is not easy to see how the matter is to be handled. Ticket agents, station employees and conductors would hardly be competent to decide such questions, and if a mistake is made, it seems probable there would be just ground for action against the company, as a common carrier, for refusing transportation. In regard to the suggestion to provide apartments for the transportation of such people, it is obvious that this is a question of expense as these apartments could be used for no other purpose. Moreover the same difficulty of diagnosis occurs as people who believe themselves not to be afflicted, would object to going into those apartments. It would look as though this was a question for additional legislation, which

would provide satisfactory means for determining the diagnosis and would entitle the railroad companies to charge an additional rate of fare to such people to compensate for the special apartments which they must occupy. Our own judgment is that this recommendation is premature, and utterly impracticable, in the present state of affairs.

The eighth precaution recommends the complete disinfection of passenger coaches by sterilizing gases or vapors or fumes, both periodically and whenever the coach is known to have been occupied by known or suspected cases of communicable disease. In regard to the latter point, this is our practice at present in the case of smallpox, and it is probable that as our knowledge increases in regard to communicable diseases, it may be desirable and found essential, to disinfect when persons afflicted with other diseases are known to have been in a car. In regard to periodical disinfection, we have already put a good deal of study on this subject, and are planning for the present winter some further experiments, leading up to a completely workable scheme for disinfection of the passenger equipment. At the same time what has already been stated, must be borne in mind, as having a bearing on the necessity for periodical disinfection, namely; that fresh air, heat and sun are in themselves extremely valuable sterilizing means, and that a passenger coach from its nature, is a far better field, owing to the large amount of light, and the small space for the action of the sterilizing agencies, than even ordinary dwellings, churches, halls, etc. Here, perhaps, is the best place to say, that so far as our knowledge goes, but very few experiments have yet been made looking toward a satisfactory answer to the question of whether the air inside passenger coaches is or is not ever contaminated with disease germs. Two or three years ago some experiments were made by the United States Marine Hospital Service in which we assisted upon this point. The result of one trip in a Pullman car from Altoona to Jersey City, did not show a single pathogenic germ in the air of the car. Another experiment from Jersey City to Washington showed the presence of the pneumonia bacillus in the air. There is much need of work on this point. We have been hoping that the Marine Hospital Service with its elaborate facilities, would take hold of this question, and we are in consultation with them over the matter from time to time. It requires appliances which are rather more elaborate than we yet have in our bacteriological laboratory to take up this question. Until it is settled, the question of the necessity of periodical disinfection of passenger cars, as recommended is surrounded with more or less uncertainty. Of course as a precautionary measure, especially if a means of disinfection that is efficient and at the same time not too complicated or elaborate can be devised, it might be a desirable thing. This is what we have in mind to demonstrate, if possible, by our experiments during the coming winter.

The ninth precaution recommends the use of water and ice free from harmful contents. We think there is no question about the desirability of this precaution. So far as our own lines are concerned, we are constantly examining the water supply along the line in this way, probably three to five samples a week, minimizing, as far as possible, the danger of transmission of disease through the water. There is an enormous field in this matter, and we have planned some

methodical examinations of the more important water supplies, especially those which are used on cars. The question of filtration and purification of water for drinking purposes has been studied somewhat, and the growth of public sentiment and of sanitary knowledge is pointing strongly in the direction that all important public supplies will sooner or later be rendered more or less harmless by means now well known. Where the public supply is not or cannot be treated successfully, it may be essential for the railroad company to introduce proper sterilizing apparatus, although we are compelled to say that isolated sterilizing plants, such as are now known and available, have not thus far shown themselves to be very satisfactory. We have made a number of examinations of water from various filtering appliances, and have found most of them, only very slightly improved. The ice question is showing constant improvement owing to the introduction of ice machines and the use of distilled water in making such ice. Moreover recent experiments by the Massachusetts State Board of Health, indicate that natural ice is less liable to be infectious, even when formed from water already contaminated, than had previously been supposed. We are clearly of the opinion that the question of water supply will need constant attention, and that the recommendations under this precaution, are worthy of careful consideration.

The tenth precaution recommends the prohibition of expectoration and the providing of cuspidors. This question has recently been the subject of a very animated discussion before the Committee on Conducting Transportation at a recent meeting in Pittsburgh. The cuspidor side of it seems to be absolutely out of the question, so far as our passenger coaches are concerned. There is absolutely no place in a passenger coach where a cuspidor can be placed and have it available for the occupants. The question of meeting the difficulty by providing a disinfecting, absorbent, floor covering, has been discussed somewhat, but no satisfactory conclusion has yet been reached. In regard to the putting up of notices with an enforced penalty, the matter seems to be one for legislation, rather than for railroad regulation. Some states have already provided penalties for expectoration in public places; others have not. Probably the best that can be done with passenger coaches is to put up a properly worded notice, in regard to expectoration, which with the growth of public sentiment, in this matter, will undoubtedly have a tendency to diminish the evil. In Pullman cars and in smoking cars which have an attendant, the cuspidor can be managed, and we think they should be provided.

The eleventh precaution recommends the frequent cleansing and sterilizing of tanks for drinking water, and the handling of ice with tongs. This precaution we think is reasonable and a desideratum. It would be very simple even at terminals, and certainly every time the car went to the shop, to drain the water tank, and treat it with live steam which would completely sterilize the inside of the tank. We are clearly of the opinion that this matter should be taken in hand and orders isued to do this. In regard to handling the ice with tongs, we think this likewise should be done. It is certainly disgusting, if not unsanitary, to see an ordinary station employe with dirty hands putting ice into the tanks of drinking water, using his naked hands for the purpose. We have nothing but approval for this recommendation.

The circular recommends three further precautions as desirable, those already discussed having been regarded as imperative. These are as follows:

First: "A discouraging of the use of the common drinking cup, and an encouraging of the use of the individual cup or fountain jet." In so far as this can be done, we think it is an extremely desirable thing to have done, but this is more a question of growth of public sentiment and of knowledge on the subject, than perhaps for railroad regulation. It is well known that in certain stages of syphilis, the disease may be readily communicated by the use of a drinking cup which has been previously used by a person having that loathsome disease. It will probably not be amiss to have a neat notice in cars, to the effect that as a sanitary measure, passengers are recommended to furnish their own drinking cups.

The second of the desirable precautions recommends the use of light colored or white material for berth blankets and curtains, the idea being that the light colored material will make the dirt more evident and lead to more frequent cleaning. We are clearly of the opinion that this is an impracticable recommendation. There is an enormous amount of dirt around a railroad which is not pathogenic. Coal smoke and dust are constantly in the air, and to use white materials with any amount of washing, would make such a filthy appearance to a car in our judgment, as to make it seriously objectionable. Good, dark colored material, properly cleaned with air, or beaten, is as we look at it far better.

The third desirable precaution, is the disposition of excreta in such a way as not to disseminate this along the road, with the consequent danger of its contaminating public water supplies, etc. This question was also discussed very fully, by the Committee on Conducting Transportation at its recent meeting in Pittsburgh. Moreover an effort has been made to find out whether there have been any known cases of disease attributable to such scattering of the excreta along the line One sanitarian in reply to a direct letter on the question said in writing that the drying up of the excreta resulting in the death of the bacteria was so well known, that the danger from this source was probably quite remote. Moreover we think it is incumbent on the sanitarians to present some feasible method of handling the excreta, in a way different from the present one. As we understand the matter, there is no method as yet available for doing this. The dry earth closet has been proposed, but it seems in its known forms to be inapplicable. It is possible that as time progresses, some workable earth closet, or other form of closet will be devised which will enable the material to be carried to the end of the run. At present we do not know of any such device.

It should be stated that the circular accompanying recommends that the precautions should apply also to stations, and it will of course be understood, that with the necessary difference between stations and cars, all that we have written applies likewise to stations."

Very truly yours,

CHAS. B. DUDLEY,
Chemist.

Instead of commenting upon these letters, I prefer to leave them open to your discussion, and will close this report in a few words on quarantine as effecting interstate traffic.

At a recent meeting of the International Association of Railway Surgeons a paper on Interstate Quarantine was presented by Hon. E. L. Russell, President of the Mobile & Ohio Railroad, in which he said:

"It is not my purpose to go into the details of quarantine regulations, but to treat of the proposition to turn the whole quarantine system over absolutely to the federal government.

"This subject is naturally divided into two parts. The first is: Should the Marine Hospital Service have absolute and exclusive jurisdiction and power to prescribe rules and regulations for vessels from foreign ports seeking to enter the ports of this country, either on the Atlantic or Pacific oceans, or the Gulf of Mexico?

"It is well established that Congress has exclusive jurisdiction over all maritime quarantines. If this is true, then Congress should, by an act, confer absolute and exclusive power upon the Marine Hospital Service to prescribe quarantine rules and regulations that will prevent the introduction of infectious or contagious diseases into the United States.

"The law at present confers upon the Marine Hospital Service only partially this power. The present act in force, applicable to this subject, provides that "The surgeon-general of the Marine Hospital Service shall examine the quarantine regulations of all state and municipal boards of health, and shall, under the direction of the secretary of the treasury, co-operate with and aid state and municipal boards of health in the execution and enforcement of the rules and regulations of such boards, and in the execution and enforcement of the rules and regulations made by the secretary of the treasury to prevent the introduction of contagious or infectious diseases into the United States from foreign countries."

It is further provided that "All rules and regulations made by the secretary of the treasury shall operate uniformly and not in any manner discriminate against any port or place."

"Now, if this law is defective, these defects should be cured by additional legislation on this subject by Congress. I think that the Marine Hospital Service should be clothed with power to prescribe quarantine rules and regulations for all seaport towns and cities and should be empowered to enforce the same. Local health boards in various towns and cities would soon recognize that the Marine Hospital Service, backed by the United States, could make quarantine rules and regulations far more effective than they could themselves. If such a system was made complete with ample power and means, then the introduction of yellow fever would be prevented, and the question would never be a practical one any more in the states.

"But we have learned from experience that even the Marine Hospital Service sometimes fails to prevent the introduction of contagious and infectious diseases, such as yellow fever. When this is the case, we

have, as at present, no system of interstate quarantine rules and regulations. This brings us to the second part of this paper.

"We see that a great many public men, prominent railroad men and newspapers in the country are demanding, without giving any reason for the same, that the whole quarantine question shall be turned over to the federal government and administered by the federal government. It would appear that these people have not given the amount of thought and investigation to this subject that is necessary to reach a practical solution of it.

"It is folly to talk about conferring upon the federal government the exclusive jurisdiction of this question in the states. In the first place, it would not be legal, and could not be enforced. In order to secure an effective system of federal quarantine regulations the system must be one that is authorized by the Constitution of the United States and the power of Congress. The only power Congress has to create a national quarantine law or a national board of health with power to prescribe rules and regulations is derived from the commercial clause of the Constitution of the United States, which confers upon Congress the power to regulate commerce with foreign nations and among the several states. Under this clause, Congress is limited in its jurisdiction to legislation upon interstate traffic and interstate passengers. It has no authority to create a national board of health with power to prescribe quarantine rules and regulations that would even attempt to regulate the internal and domestic commerce of any of the states. It has power to prescribe a system of quarantine that will regulate interstate carriers, interstate commerce and interstate passengers.

"Congress has created an interstate commerce commission and in creating this commission Congress expressly excluded from its operation the internal and domestic carriers wholly within the state, and the internal and domestic traffic and passengers wholly within the state."

Mr. A. W. Sullivan, Superintendent of the Illinois Central Railroad, remarks as follows:

"There are upon the Illinois Central system 969 regular stations, from any of which persons may have occasion to travel to points within the territory covered by quarantine regulations, or to make shipments of freight. Naturally they will apply to the railroad agent for information as to the conditions prevailing there and expect to receive correct and reliable information. The management has endeavored faithfully, by the issuance of frequent bulletins, to keep all of its agents well informed as to the situation, but with local quarantine regulations in effect at something like 200 different points, varying more or less from each other and being amended from day to day, it becomes well nigh an impossible undertaking to keep pace with the rapid changes that occur. The resulting uncertainty frequently leads to vexatious delays, great personal inconvenience and a serious disturbance of business.

"From a railroad point of view, it is considered that the most useful field for the exercise of quarantine functions by the municipal and county authorities lies in the control and regulation of highway traffic.

"That the inspection and regulation of traffic upon local lines of railway within the state can be handled to good advantage by the state boards of health.

"That upon the main lines of railway the regulation of passenger and freight traffic by the Marine Hospital Service is conducive to the best results.

"As to the train inspection system of the Marine Hospital Service for the regulation of passenger traffic, but little can be offered in the way of suggestion in the handling of this intricate problem to which so much intelligent consideration has been given by the able and experienced officers of that service. It is to be considered, however, as one of the practical conditions that the car equipment ordinarily in use must of necessity be continued throughout a period of this kind, as it is not possible to substitute rattan seated cars for the standard upholstered equipment in general use. Whatever objection there may be from a sanitary point of view to the use of upholstered equipment, it is the only kind available in through passenger service, and with the marvellous thoroughness of the modern methods of cleaning cars by compressed air, combined with efficient disinfection each trip, it would appear that hygienic conditions are adequately safeguarded.

"The regulaton of the freight traffic, as a result of the conventions which have been held to consider the subject, appears to be rapidly assuming intelligent and practicable shape. The adoption of classified schedules, with a comprehensive free list of commodities incapable of carrying infection, greatly facilitates the labor of handling freight and materially reduces the task of supervision by concentrating that work upon those commodities which require special attention.

"The establishment of relay camps for change of engine and train crews outside of infected districts, with adequate policing to establish non-intercourse between the opposite portions of the camp, affords an effective method of maintaining through train service without risk to adjacent territory capable of infection.

"In conclusion it may be stated that the principle enunciated by the epigramatic expression of Surgeon White of the Marine Hospital Service, that 'quarantine is a sieve, not a dam,' is recognized to apply equally to passenger as to freight traffic, and that the intelligent application of this principle to the operation of a line of railway will give ample scope for the conduct of transportation in a manner consistent with the essential requirements of business and without hazard to the welfare of the community."

In conclusion, allow me to add that the more permanent the means and methods adopted by health authorities, the more satisfactory they will prove to the commercial world, and the general manager. A vacillating policy on the part of health officers cannot produce good results. The sensational and sentimental should be entirely excluded from quarantine and sanitation. The bare facts necessary for the protection of the lives and health of the people should prevail. The imaginary troubles of the fanatical observer, as well as of those who would try to solve the problem from a commercial standpoint, because they have something to sell, should be relegated to oblivion.

TRANSPORTATION OF PERSONS SICK WITH TRANSMISSIBLE DISEASES.

By J. N. HURTY, M. D., Indianapolis, Ind.

We are all of the same mind in regard to the transportation by common carriers of persons sick with smallpox, diphtheria, scarlet fever, leprosy, bubonic plague, yellow fever and typhus fever. Indeed, public opinion is violently opposed to transporting cases of these diseases. Leprosy is not as easily transmitted as is tuberculosis, and compared to the latter malady in its destructiveness of human life it amounts to nothing at all. Yet, the mere mention of the word leprosy, causes a shudder, and a riot would result if the attempt were made to introduce a leper into a railway car. However, in face of these facts, the word tuberculosis makes little or no impression. And how strange this is, when we know that almost certainly not less than 150,000 of those now living in the United States will be dead of tuberculosis within the next twelve months, and when too it is quite certain that three times this number, or 450,000 will be attacked by the disease. Influenza, also a transmissible and very destructive malady, which kills a thousand where leprosy kills one, and although every case proceeds from a previous case, still people do not fear it sufficiently to taken even ordinary precautions against it. These and other considerations make it plain that it will be difficult indeed to enforce rational and scientific measures necessary to prevent transmission of of infection from the sick to the well in connection with passenger transportation. When we stop to think that the incalculable human suffering, the fearful loss of life and of money which we have endured on account of grippe, has been brought to us principally on railways and still there is no opposition to bringing more infection but instead there is violent opposition to all sensible measures to stop free distribution of the same, then we halt and wonder at the impracticableness of humanity. The house on wheels, as Dr. Conn so aptly terms the railway car, has, as said, brought us quite all our grippe and that this house on wheels is a potent factor in the transmission of consumption is plain, even upon cursory examination. I have before related an incident in my own experience showing that tuberculosis infection is most certainly at times turned freely loose into cars. It was some years ago while touring in the West, and when snugly ensconsed in a Pullman berth, I was awakened several times by coughing, hawking and spitting noises which proceeded from the opposite side of the

car. In the morning I looked out between the curtains and across the aisle and at that moment there protruded from between the curtains of the opposite berth a human face, thin, wan, and awfully pallid. The eyes were sunken deep between the protruding cheek bones, and shone with unnatural light. The lips were thin and bloodless, and the coal black hair of the mustache, eyebrows and head, had the effect of projecting the picture deep into my mind. A coughing paroxysm seized the consumptive and quantities of sputum were ejected. The edge of the berth showed damp spots, the curtains also showed them, and the carpet under the over-running cuspidor was badly soiled. Particles of sputum must also have been sprayed into the air by coughing, and undoubtedly, the exterior of the curtains to my own berth, and the plush and window curtains to the patient's berth were infected. Certain it was, the carpet contained millions of organisms which sometime would be flying in the air of that coach. The mattress with its polluted edges, the infected draperies and the blankets, were, as usual, in due time folded and hidden away. I wondered what would be done with the contents of the cuspidor. This was finally dumped onto the track through the water closet, the cuspidor then rinsed carelessly at the common washing basins and finally wiped with a towel. The towel went into the heap of dirty linen. I submit this to show that it will be very difficult to secure, what we so glibly call "Proper care of sputum." And here let me ask — would it have been inhuman or unkind to have denied transportation to this advanced case of tuberculosis? That this man all day and the following night, and the next day and the next night, and so on to the end of his life kept up this copious distribution of tubercle infection there can be no doubt, and that finally he went back over the same route in a coffin is very sure. What is gained by permitting this? Was humanity, sentiment and kindliness, expressed and cultivated? If they were, how about the new cases which undoubtedly followed this one? To my mind, it is not cruel and unkind to deny the privilege of travel to persons carrying the infection of the most destructive disease known, and especially as the traveling will do him no good and he is certain to return in the baggage car. Yes, I say — *Let no case of advanced pulmonary tuberculosis be transported by common carriers.* The Western Association of Railway Passenger Agents in 1901 passed a resolution that "Tuberculous passengers should be controlled in some way as not to give offense to the traveling public and so as not to spread infection." The resolution proposed separate cars or compartments. Is this plan practicable? Would consumptives consent to ride in separate cars or in compartments known to be for consumptives? I think not. And the separate car or compartment for cases of smallpox, diphtheria and

scarlet fever would not be tolerated by the public. The idea of the railway passenger agents seems not to be practicable. Indeed, the more we study the clearer it becomes that the transportation of cases of advanced pulmonary tuberculosis — is useless, deleterious and unnecessary. Incipient cases, may, of course, be allowed to travel. They have little sputum and this makes it possible to sanitarily dispose of it, yet they may easily spray the air with their infection while coughing but this could be guarded against.

TRANSPORTATION OF TYPHOID FEVER.

The transportation of typhoid fever convalescents is a menace to the public health. It is well known that the Bacillus typhi abdominalis may exist in virulent form in dejecta even after the patient has apparently recovered from all effects of the disease. This being true — can any more admirable plan be conceived for distributing typhoid infection than that of transporting convalescents on cars? The returning soldiers from the typhoid camp at Chickamauga certainly planted the infection at places in Indiana, for several epidemics were reasonably attributed to such source. At the present time it would be impossible to prohibit the traveling of those recently recovered from typhoid fever, yet convalescents are sure to carry the infection, and they should not be permitted to travel, unless the present abominable car closets. which so admirably favor the distribution of dejecta over the earth, are abolished, and earth closets used instead. It certainly is practical to place drawers containing dry earth beneath the hoppers of car closets, and to provide a shake apparatus for adding dry absorbent earth when the closet is used. At terminals the drawers could be emptied or changed, the offense of the work not being equal to that of mopping up the pools of spit found in all smoking cars. It may be that in the near future the typhoid patient will be considered dangerous until bacteriological tests prove the typhoid bacilli to be absent from the dejecta, just as the period of quarantine for diphtheria is determined by the presence of the bacilli of the disease.

GRIPPE.

Grippe is a dangerous and transmissible disease. The infection is in the oral and nasal secretions, and without doubt, all sufferers from the malady should take scrupulous care of such secretions. The deaths reported as directly due to grippe in Indiana in 1902, numbered 456, and those from scarlet fever 164. The deaths indirectly due to grippe, if added to the first figure, would undoubtedly treble it, and then the figures would be, scarlet fever deaths 164, grippe deaths 1,368. Both

are infectious complaints, and while there is no hesitancy on the part of the public to demand prohibition of travel to scarlet fever patients, it is certainly true the same public would raise loud protests against the proposition to forbid the privilege of travel to those affected with grippe, even when the case was severe. Yet the statistics of scarlet fever, which show it is less dangerous than grippe, would probably not cause public opinion to change. Another point about grippe appears in the fact that not a few of the people attacked develope the trouble shortly after riding on cars. We frequently hear the blame laid on the railway coaches, and not without abundant reasons. The same is true of ordinary coughs and colds. The great destructiveness of grippe, its serious sequelae, its infectiousness and preventability being so well known, why not forbid, as one measure toward its restriction, the privileges of travel to him who has it? In my judgment, persons afflicted with grippe, should not be allowed upon railway trains, except they most carefully collect all infectious secretions and destroy them by fire or disinfectants.

It is obviously unnecessary to discuss the transportation of persons afflicted with smallpox, yellow fever, bubonic plague, diphtheria, scarlet fever, typhus fever and leprosy. I take it for granted also, that we need not consider whooping cough or measles.

SUMMARY.

The public welfare can in no degree or manner be advanced through risking the increase of transmissible diseases. All clearly see the possible harm which might attend the transportation in railway trains of cases of smallpox, yellow fever, bubonic plague, diphtheria, scarlet fever, typhus fever and leprosy; and in consequence, public opinion would not tolerate such a thing. An equal understanding in regard to pulmonary tuberculosis, influenza and typhoid fever, would develop a public opinion demanding, if patients having these diseases are allowed upon trains, that rational regulations intended to prevent transmission must be rigidly enforced. Lastly, special compartments for persons sick with communicable diseases are impracticable.

ON CAR SANITATION IN THE REPUBLIC OF MEXICO.

By Dr. JUAN BRENA, Zacatecas, Mexico.

It is not the object of this paper to repeat once more what has been said by the writers on hygiene and health authorities about the construction, ventilation, disinfection and the other means of preventing railroad cars from becoming a source of danger to the health of the travelers. This Association has in several sessions discussed this matter, and if the recommendations made in the "Suggestions by the Indiana State Board of Health to Indiana Railways" and those of the report of Prof. Woodbridge published in Vol. XXVI of the "Papers and Reports" would be carried into effect we should have but little left to wish for in matters of car sanitation. While I would be glad to state that the railroad companies in Mexico are exercising due care in protecting the health of passengers, facts compel me to make out a long list of omissions hurtful to the health of the traveling public, and to call attention to defects which are apparent to the most superficial observer and to ask this assembly to help with suggestions, recommendations, and by bringing the influence of its members to bear to remedy a state of affairs which seems to belong to an era of civilization which has long since passed away.

CONSTRUCTION OF CARS.

It is a well known fact that germs of infectious diseases are floating in the air and are by it deposited in the veneers, mouldings and ornaments of furniture and thence again taken up by the air and inhaled with it; and for that reason writers on hygiene and sanitary authorities have again and again recommended simplicity of ornamentation, hardness of materials and polished surfaces for the interior of cars. The designers of the cars of the Mexican railroads seem to have had entirely different ideas on this subject. The first-class cars have a multitude of decorative grooves and mouldings and velvet or cane seats. In the second class cars the seats and backs are formed by a set of boards about 3 to 5 centimeters in width which at the places they are joined to one another cause an empty space to be formed between them. In the third-class cars the seats are of a similar construction, or made of wood perforated with holes so as to form a special design for an ornament. The blinds at the windows are made of a number of small, narrow pieces of wood between every two of which there is a space left. It is easy to understand that such con-

struction promotes and causes the deposit, retention and accumulation of the dust which is floating in the air near and around the traveler.

CAR CLEANING.

This is generally done while the train is moving, by sweeping the floor with a short broom or brush and often without the sprinkling of water; and thus the dust is stirred up, fills the air and is deposited on the seats, blinds windows, or the passenger, or is inhaled by him. As there are not, and never have been, any cuspidors in second and third-class cars, the floor is covered with matter expectorated, cigar and cigarette pieces, food, fruit peel, matter vomited by some sick or intoxicated person and sometimes even the liquid or solid excretions of some small child. And, above and around this all, there is a multitude of flies during the hot season, the number of which is it not easy to exaggerate. In the first-class cars the seats are cleaned with a sponge, which is generally black on account of its having been used for a long time, and which is moistened in a small vessel of water, which, even if it is clean at the beginning, will soon be filled with a mass of dirt and mud which by means of the sponge is again smeared over the seats which are supposed and intended to be cleaned by this operation. I have never heard of any disinfectant having been dissolved in the water used in the cleaning of the cars, nor that they are disinfected or fumigated with formaldehyde or any other disinfecting substance at stated times. And they do need it; for if by law persons having contagious diseases are not admitted into the cars, there is no effort made to carry into effect the provisions of this law. I can assure you that persons who cannot even get on or off the car without help are allowed to travel in the midst of healthy people without any body objecting or asking if they have a contagious disease or not.

As it was pointed out at the eleventh Congress of Hygiene and Demography, which was held in Brussels last month, we do not realize that, when we enter a railway carriage, and, however short our stay there may be, we are putting ourselves in contact with furniture and employes who may communicate to us infectious germs that may have been left there by the passengers who have preceded us. So far, hygienists have failed to discover a practical way of disinfecting railway carriages, and other public conveyances, effective enough to be recommended to the authorities, for, as we all know, no method of fumigation now known will destroy the tuberculosis bacillus.

For this reason the universal adoption of the English practice, is most desirable, which makes it a legal offense for persons suffering from infectious diseases to travel in public conveyances. The fre-

quent cheap railway excursions nowadays, some religious, others political or patriotic, and others purely recreative, cause an immense number of people to travel who, in a great number of cases, are scandalously overcrowded, some having to stand in the center of the carriages, others to sit on the floor; some are literally packed in freight cars and some in cattle vans. In any of these excursions the presence of persons suffering from infectious diseases is not only possible, but probable, and this is more particularly the case when the excursion is a religious one and its object a pilgrimage.

DRINKING WATER.

I know of no company having supplied sterilized water for passengers' use; the water used is as it has been taken from the ground. Ice is furnished in "Pullman" and first-class cars only, being handled without precautions whatever by the employes with unwashed hands, is broken into pieces on the ground, and when it falls down on the ground is picked up again and put into the water tanks. These, in first-class cars, are found on top of the wash-stand, of which in second and third-class cars there is none. Not very long ago I saw a passenger who, probably suffering from some disease of the nose, washed the inside of it in the wash-stand, drawing up the water from the hollow of his hand, and expectorating then into the basin the water and discharge from the nose, and so carelessly that some of it must have been thrown upon and into the tin cup which was standing near the basin on the wash-stand (chained to it), and which is used by the traveling public as a drinking cup. I also have seen a woman taking off the cover of the water tank and dipping a soiled handkerchief repeatedly into the water, with which she then rubbed the face of a child. There is only one towel for all the passengers in a first-class car, and it is only a short time that water for washing purposes has been furnished in them, being formerly available in Pullmans only. I do not know if the inside of the water tanks is regularly cleaned, but I am quite sure that it is never rinsed with boiling water, nor sterilized by any of the other methods recommended by boards of health.

WATER CLOSET.

The water closet in the second and third-class cars consists simply of an opening and a pipe, through which the excreta are discharged upon the road-bed if the train is at the station or far from it. The precaution of locking the water closet while a train is near a station, which is observed in the United States, is not taken on Mexican lines. There is an almost unbearable odor constantly noticeable around the water

closet, being caused by the excrements adhering to the inside of the water closet pipe and a preparation which contains carbolic acid. The only difference between the water closet of the second and third-class and that of the first-class is, that in the latter the pipe is closed at its lower end with a movable cover.

VENTILATION.

In regard to this subject, I have to say that the defects pointed out by Dr. Orvananos still exist. The number of the beds in the sleeping cars is excessively large, considering the capacity of the cars, and, even if they are not all occupied, there is not enough pure air available for breathing and the health of the occupants of the car is in grave danger.

After having thus enumerated a few of the most noticeable defects in the sanitation of cars, which should be remedied, I would now like to refer briefly to some matters which, although not directly connected with sanitation, deserve, nevertheless, consideration because they have some bearing upon the comfort and welfare of the traveler in railroad cars.

Passengers in cars have a right to demand that they should not be annoyed by the presence or the acts of persons who are under the influence of liquor. Their admission to the cars should be absolutely prohibited, and if any passenger should become intoxicated while on board the cars he should be made to leave them. It has hurt me to the heart to witness the humiliation and anguish of cultured women, compelled to travel in cheap class cars on account of their poverty, caused by the importunities and obscenities of intoxicated men. On a journey I had occasion to make a few weeks ago I saw, during the night, an elderly man, accompanied by three young men, enter the train, all of whom were so much the worse for liquor that their staggering gait, when they tried to walk, was most noticeable, and caused them to bump up against their neighbors. It is impossible to describe the fuss, commotion and discomfort they caused by frequently leaving and re-entering the car, blocking up the passages, embracing some of the passengers, insulting others, and annoying all with their importunate offers of drinks. When, in the small hours of the night, their obstreperous behavior gave place to alcoholic stupor, and the peaceable passengers thought they were at last going to have a chance of getting a little repose, the Pullman porter, and the seller of fruits and tobacco, grandiloquently called agent of publications, the latter, in a high state of intoxication, made their appearance, and, seating themselves near the center of the car, started a vocal concert, which lasted until nearly

sunrise, only occasionally suspended when, by way of variation, these amiable gentlemen occupied themselves chaffing and wrangling with two "ladies" who had evidently also been paying homage to Bacchus, "not wisely, but too well."

There is finally on the trains another class of persons equally obnoxious and objectionable as those under the influence of liquor, and which the railroad companies, for the cause of public morality, and in their own self interest, should severely restrain and discipline. I wish to allude to the ill behaved and brutal brakemen who, as they are employes of the train and at home on it, sing and whistle in second and third-class cars when and as long as they like, use language which would make a freight driver blush, and annoy and bother people by falling against them and making silly and uncalled for jokes, over which they themselves laugh as loud as they feel like.

There is no doubt that a sickly or delicate nervous system would suffer greatly when exposed to those disagreeable impressions. It must be thought that very many people travel in search of health, escaping from painful obsessions of the spirit, exhausted by over work or by mental strain, preoccupied by financial troubles or some other of the contraries which everybody endures in the struggle for livelihood. In any of these or like conditions, and without our considering at present of other inconveniences, the incessant irritation alone caused upon the auditory nerves by such discordant impressions as those already indicated constitutes a real danger to health.

Unluckily, the suggestions and observations made by scientific writers have been neglected, and no attention seems to have been paid to them up to date, and thus the grave defects alluded to above are still existing, be it on account of the ignorance or the greediness and ill understood self interest of the railroad companies. But we will hope that the obstacles will not dishearten us. They will, on the contrary, incite us to preach and work with the tenacity of the water drop which falls upon the hard stone. Right shall at last prevail.

PERTAINING TO THE TRANSPORTATION OF THE DEAD.

By Dr. H. M. BRACKEN, St. Paul, Minn.

In many instances there seems to be an impression among physicians that when their patients are dead they have no further responsibility. This may be true judged from a professional point of view, but there are responsibilities, resting upon medical men whose patients die, outside of professional duties. If a patient has died away from home, the medical attendant should take some interest in seeing that the remains can be returned decently and in order to the place from which the patient came alive, for final burial. This does not require personal supervision on the part of the medical attendant, but it does demand an interest on his part in the effort that has been made during the past few years by sanitarians, embalmers, and transportation companies to secure proper preparation for the remains of the dead in order to permit of their being transported to their final resting place without being a nuisance or a source of danger while in transit, or at the point of destination.

Prior to 1895 there were no general rules governing the preparation of the dead or the transportation of same. In some instances there were regulations that almost, if not quite, prohibited the shipment of a corpse into or out of the district. In other cases the question of transportation of the dead was left largely in the hands of the railroads. These corporations, for the protection of their own employes, and also because of the restrictions upon delivery of remains at points of destination, refused to carry the body of one who had died of any contagious disease. The bodies that were received by the railroads for transportation bore no evidence that they had been properly prepared for shipment and in many instances decomposition was so far advanced before they reached their destination that they were in every sense a nuisance in transit and at the place where received for burial. In the past it was no uncommon thing to find a coffin with its contents fastened on the platform of a baggage or express car because the stench coming from it was too great to be borne by those inside the car.

This condition has been changed to a great extent, but many physicians seem still ignorant of the fact, while others are even antagonistic to those in their community who are endeavoring to bring about this improved condition of affairs.

In 1895 a committee representing the American Association of General Baggage Agents, the National Funeral Directors' Association, and

the Conference of State and Provincial Boards of Health was created to devise some plan by which safety and decency might be secured in the transportation of the dead. As the result of this committee's work certain rules were formulated governing the preparation and shipment of dead bodies. These rules were adopted by the Conference of State and Provincial Boards of Health in August, 1897. To put them in force it was necessary for each state to give them legal standing either as sanitary regulations through the State Board of Health, or by legislative act. These rules permitted the shipment of the remains of the dead under certain restrictions, except when death had been due to smallpox, Asiatic cholera, yellow fever, typhus fever or bubonic plague. They were first put into effect in Iowa and Minnesota in 1898 by act of their respective State Boards of Health. To carry out these regulations three things were necessary: First, a system of licensing for embalmers in order that provision might be made for the proper preparation of the body for shipment; second, a uniform shipping system; third, sanitary supervision.

There are now three methods under which a license may be issued:

1. Under the sanitary regulations of the State Board of Health.

2. Under special state laws granting certain privileges to licensed embalmers.

3. Under state laws compelling all embalmers within the state to secure a license.

The first two methods are good, for the license in either case is granted after an examination.

In states under one or the other of these systems, there are two classes of embalmers or undertakers — the licensed and the unlicensed. The unlicensed undertaker soon finds himself at a commercial disadvantage, and if he has any pride in his business he will promptly take steps to secure a license or to employ licensed embalmers.

The third system has one remarkably weak point, for in compelling all embalmers in the state to secure a license it has to take into consideration those who were in business before the passage of the law. There are, therefore, three classes of embalmers or undertakers in these states, viz., those who have passed an examination and are licensed on their demonstrated ability, those who are licensed without examination and are commonly termed "exempts," and the unlicensed or illegal embalmer. An exempt may or may not be a good man. The people of his state or even of his own neighborhood are not able to judge as to his ability. He cannot or should not be recognized by other states than the one in which he resides as a suitable person to make shipments of the dead. In other words, only the embalmers who have demonstrated before an examining board their ability to properly pre-

pare a body for shipment should be recognized by sanitary bodies. For shipping purposes, the "exempt" and the unlicensed should be placed in the same category.

At the present time all of the states have provided for shipment of the dead under one or the other of these three rules except the following:

1. Massachusetts and New Jersey, where an attempt was made to secure legislation, but without success.

2. Arkansas, where the State Board of Health promised to put in force a licensing system, but has failed to do so up to the present time.

3. Maryland, where the license system is nominally in force, but where, in fact, it applies only to the city of Baltimore.

4. California, Nevada, Oregon, Rhode Island, Mississippi, and the District of Columbia, where no shipping regulations are in force, nor so far as I can learn, has any legislative effort been made to secure such.

In one of the states that has not yet adopted rules by legislative act or sanitary regulation bearing upon the general shipment of the dead it appears that during a recent legislative session a bill, introduced to provide for a licensing system among embalmers, and regulations to govern the transportation of the dead, was *killed by medical men* and the same medical men, it is said, went before medical societies and boasted of the fact. It is quite possible the bill was faulty. If so it should have been corrected, not killed.

The above was the course pursued in a state that is under excellent sanitary supervision and one which should have made provision in some way or other long before this for the proper shipment of the remains of those whose residence, while living, was in some other state, but who were so unfortunate as to die in the state under consideration.

The second point necessary for the proper carrying out of the shipping regulations, viz., a uniform shipping system, has been brought about in all states licensing embalmers.

Formerly each railroad system had its own form of shipping blank. Now, in the licensing states, the railroads no longer issue shipping permits for the transportation of the dead. The shipping blanks are of the form prescribed by the Conference of State and Provincial Boards of Health in 1897, and are printed by the licensing body of the state. They are furnished to health officers and licensed embalmers. They are in duplicate. One of the copies is turned over to the railroad officials and by them is finally returned to the licensing body of the state from which the remains were shipped.

These two points provide for the third, viz., proper sanitary supervision. The sanitary authorities of a state know that certain shipments

of the dead have been made. Sanitary authorities are dependent upon the railroads and the receiving embalmers for returns bearing upon the fulfillment of the regulations. Duplicate shipping blanks returned by the railroad to the licensing shipping body show whether a shipment has been properly made. Speaking for Minnesota I can state that railroads are aiding us in every way. They seem to appreciate the great advantage of the present methods over those which prevailed prior to 1898. As to whether remains have been prepared for shipment according to regulations, sanitary authorities are dependent upon first, the honesty of the licensed embalmers; second, upon reports from the receiving point as to the condition of the remains when they reached their destination. This latter is a very important point. Some embalmers, it is needless to say, are careless and this applies as well to licensed as unlicensed embalmers. Such careless individuals need a stimulus to do good work and they have it in the fact that their work is under scrutiny. If a report is returned to a licensing body that a licensed embalmer has shipped a body without proper preparation or precautions, it is very easy, with the first offense, for the proper official to give a reprimand and a warning that the license will be withdrawn if the offense is repeated. Speaking from experience I can assure you the offense is not likely to occur a second time.

That the rules and regulations adopted by the Conference of State and Provincial Boards of Health in 1897, and amended slightly in 1901, have simplified shipments, thus greatly benefiting those whose friends have died away from home, is evidenced in a recent address given by Mr. S. A. Smart, General Baggage Agent of the Great Northern Railway, where he states that the shipments of the dead over the above road have steadily increased since 1898 and that for the fiscal year ending June last (1903) the increase over the year just preceding the adoption of the shipping rules in Minnesota (June, 1898) was 124 per cent. It is impossible to estimate the great satisfaction that such increase in the shipment of the dead must have been to afflicted friends. Incidentally it may be said that the success in the administration of the shipping rules that brought about such a phenomenal increase in the number of bodies shipped was largely due to Mr. Smart's personal interest in the work. He has not only been of great assistance to the Minnesota sanitary authorities, but he has urged and encouraged other states throughout the northwest to fall in line in this good work.

Mr. Smart draws attention to the fact that to "boards of health is delegated the protection of the public and in the discharge of that im porant function such boards are given almost unlimited authority to promulgate arbitrary rules and regulations tending to suppress the spread of infectious diseases," and he argues that every one should

supplement the individual efforts of the sanitary officials in order to bring about such protection. In this he is correct, and his argument applies particularly to medical men.

Certain states have argued that our rules of 1897 were not liberal enough and that no restriction should be placed upon the shipment of those who had died of smallpox, yellow fever, cholera, typhus fever or bubonic plague. It is true that an embalmer should be able to make the remains of a smallpox patient as safe for shipment as those of a scarlet fever patient. It is also true that the remains of a yellow fever, cholera, typhus fever or plague patient should be so prepared as to be safely shipped. I feel, however, that the Conference did quite right in 1897 in prohibiting the shipment of such remains, for public sentiment if no other argument was sufficient to justify such action. Still further, it is an undeniable fact that all licensed embalmers were not, and still are not, capable of preparing such bodies for shipment. The protection given may be sufficient so long as no accident occurs to the remains while in transit, but a railroad wreck might leave a corpse with no protection, so far as the spread of an infectious disease is concerned, except that of the embalming fluid and the cotton cover. It is a mistake to attempt to protect the public by the use of specially constructed coffins or boxes for the shipment of highly infectious disease cases. The boxes and coffins may be broken off. In the enforcement of regulations drawn up for the protection of the whole people the point should be insisted upon that states and provinces adopt a common system. It is better to make haste slowly than for states or provinces to formulate rules not in conformity with the national rules, for such state rules apply only to the locality in which they are adopted. At the same time they may cause great confusion. For example: If a state has rules that are more lax than the national rules, that fact may be overlooked by the local (state) officials and a body may be shipped into another state contrary to the regulations of the latter. In such a case there would be a delay of the corpse at the state boundary or a breach of trust in the event that the shipment was continued into the receiving state contrary to the shipping regulations.

The shipping rules were thoroughly discussed at the Conference of State and Provincial Boards of Health of North America held last week at Baltimore and were amended to read as follows:

RULES ADOPTED BY THE CONFERENCE OF STATE AND PROVINCIAL BOARDS OF HEALTH OF NORTH AMERICA, AT ITS REGULAR MEETING, OCTOBER 23D AND 24TH, BALTIMORE, MD.

Rule 1. The transportation of bodies dead of smallpox or bubonic plague from one state, territory, district or province to another, is absolutely prohibited.

Rule 2. The transportation of bodies dead of Asiatic cholera, yellow fever, typhus fever, diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), erysipelas, glanders, anthrax or leprosy, shall not be accepted for transportation unless prepared for shipment by being thoroughly disinfected by (a) arterial and cavity injection with an approved disinfecting fluid; (b) disinfection and stopping of all orifices with absorbent cotton, and (c) washing the body with the disinfectant, all of which must be done by an embalmer holding a certificate as such, issued by the state or provincial board of health or other state or provincial authority provided for by law.

After being disinfected as above, such body shall be enveloped in a layer of dry cotton, not less than one inch thick, completely wrapped in a sheet securely fastened, and encased in an air-tight zinc, tin, copper, or lead-lined coffin or iron casket, all joints and seams hermetically sealed, and all enclosed in a strong tight wooden box. Or the body being prepared for shipment by disinfecting and wrapping as above, may be placed in a strong coffin or casket and said coffin or casket encased in an air-tight zinc, copper, or tin-lined box, all joints and seams hermetically soldered.

For interstate transportation under this rule only embalmers holding a license issued or approved by the state or provincial board of health or other state or provincial authority provided for by law, after examination, shall be recognized as competent to prepare such bodies for shipment.

Rule 3. The bodies of those dead of typhoid fever, puerperal fever, tuberculosis, or measles, may be received for transportation when prepared for shipment by arterial and cavity injection with an approved disinfecting fluid, washing the exterior of the body with the same, and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a sheet securely fastened, and encased in an air-tight metallic coffin or casket, or air-tight metal-lined box, provided that this shall apply only to bodies which can reach their destination within thirty hours from the time of death. In all other cases such bodies shall be prepared by a licensed embalmer holding a certificate as provided for in Rule 2. When prepared by a licensed embalmer as defined and directed in Rule 2, the air-tight sealing and bandaging with cotton may be dispensed with.

Rule 4. The bodies of those dead from any cause not stated in rules 2 and 3 may be received for transportation when encased in a sound coffin or casket and enclosed in a strong outside wooden box, provided they can reach their destination within thirty hours from the time of death. If the body cannot reach its destination within thirty hours from the time of death, it must be prepared for shipment by arterial and cavity injection with an approved disinfecting fluid, washing the exterior of the body with the same and enveloping the entire body with a layer of dry cotton not less than one inch thick and all wrapped in a sheet securely fastened, and encased in an air-tight metallic coffin or casket or an air-tight metal-lined box. But when the body has been prepared for shipment by being thoroughly disinfected by a licensed embalmer, as defined and directed in Rule 2, the air-tight sealing and bandaging with cotton may be dispensed with.

Rule 5. In the shipment of bodies dead from any disease named in Rule 2, such body must not be accompanied by persons or articles which have been exposed to the infection of the disease, unless certified by the health officer as having been properly disinfected.

Before selling tickets, agents should carefully examine the transit permit and note the name of the passenger in charge, and of any others proposing to accompany the body, and see that all necessary precautions have been taken to prevent the spread of the disease. The transit permit in such cases shall specifically state who is authorized by the health authorities to accompany the remains. In all cases where bodies are forwarded under Rule 2, notices must be sent by telegraph by the shipping embalmer to the health officer, or when there is no health officer to other competent authority at destination, advising the date and train on which the body may be expected.

Rule 6. Every dead body must be accompanied by a person in charge, who must be provided with a passage ticket and also present a full first-class ticket marked "Corpse" for the transportation of the body, and a transit permit showing physician's or coroner's certificate, name of deceased, date and hour of death, age, place of death, cause of death, and all other items of the standard certificate of death recommended by the American Public Health Association and adopted by the U. S. Census Bureau, as far as obtainable, including health officer's or Registrar's permit for removal, whether communicable or non-communicable, the point to which the body is to be shipped, and when death is caused by any of the diseases specified in Rule 2 the names of those authorized by the health authorities to accompany the body. Also the undertaker's certificate as to how the body has been prepared for shipment. The transit permit must be made in duplicate, and the signature of physician or coroner, health officer and undertaker must be on both the original and duplicate copies. The undertaker's or registrars' certificate and paster of the original shall be detached from the transit permit and securely fastened on the end of the coffin box. All coffin boxes must be provided with at least four handles. The physician's certificate and transit permit shall be handed to the passenger in charge of the corpse. The whole duplicate copy shall be sent to the official in charge of the baggage department of the initial line, and by him to the secretary of the state or provincial board of health of the state or province from which said shipment is made.

Rule 7. When bodies are shipped by express, a transit permit, as described in Rule 6, must be made out in duplicate. The undertaker's certificate and paster of the original shall be detached from the transit permit and securely fastened on the coffin box. The physician's certificate and transit permit shall be attached to and accompany the express way-bill covering the remains and be delivered with the body at the point of destination to the person to whom it is consigned. The whole duplicate copy shall be sent by the forwarding express agent to the secretary of the state or provincial board of health of the state or province from which said shipment was made.

Rule 8. Every disinterred body, dead from any disease or cause, shall be treated as infectious or dangerous to the public health, and shall not be accepted for transportation unless said removal has been

approved by the state or provincial health authorities having jurisdiction where such body is disinterred, and the consent of the health authorities of the locality to which the corpse is consigned has been first obtained; and all such disinterred remains, or the coffin or casket containing the same, must be wrapped in a woolen blanket thoroughly saturated with a 1-1000 solution of corrosive sublimate, and enclosed in a hermetically soldered zinc, tin, or copper-lined box. But bodies deposited in receiving vaults shall not be treated and considered the same as buried bodies, when originally prepared by a licensed embalmer as defined in Rule 2, and as directed in Rule 2 or 3 (according to the nature of the disease causing death), provided shipment takes place within thirty days from the time of death. The shipment of bodies prepared in the manner above directed by licensed embalmers from receiving vaults may be made within thirty days from the time of death without having to obtain permission from the health authorities of the locality to which the body is consigned. After thirty days the casket or coffin box containing said body must be enclosed in a hermetically soldered box.

Rule 9. All rules and parts of rules conflicting with these rules are hereby repealed.

It is to be hoped that all states now having a license system for embalmers will so modify their present shipping regulations as to conform to these national rules. It is further to be hoped that the present states without any licensing system may quickly fall into line either through state board of health regulations or legislation, for those of us who reside in licensing states do not wish to continue the risk of dying in an unlicensing state and in consequence, burial in an uncongenial soil.

Summarized, the licensing system has brought about the following conditions:

1. Shipment has been simplified and the annoyances which in many instances were prohibitive prior to 1898, have disappeared.

2. Uniform regulations have been established so that it is now only necessary for sanitary officials to know that the remains were prepared by a licensed embalmer of the first class, in order that they may safely permit their shipment, or the receipt of a shipment at destination.

3. A uniform shipping blank is prepared by the various state sanitary authorities and is in general use.

4. The remains of those who have died of a communicable disease may be safely shipped for any distance.

5. A shipped body need no longer be a nuisance while in transit or at point of destination.

6. A class of men and women thoroughly conversant with the proper methods for the disinfection of premises and of individuals has been created; a class of sanitarians, in fact, that can be very helpful in any community.

REPORT OF COMMITTEE ON DEMOGRAPHY AND STATISTICS IN THEIR SANITARY RELATION.

By W. A. KING, Chairman, Washington, D. C.

At the last meeting the Association adopted a resolution approving the efforts of this committee to secure the extension and improvement of the system of registering deaths, as the basis of mortality statistics, by the enactment of adequate laws and the uniform use of a standard form of certificate, and authorized it to continue work upon the same lines, in coöperation with the government offices interested and the committees of other organizations appointed for the same purpose, in pursuance of which the committee submits the following report:

The enactment of laws being necessarily a function of state governments, it was considered most desirable to secure the approval of the Congress of the United States through an advisory resolution directed to the state legislative authorities requesting "favorable consideration and action" — this being the limit of the power of Congress in the premises. A resolution was accordingly drafted and presented to Congress, which manifested its appreciation of the importance of the matter by promptly passing it — a very unusual action.

In bringing the matter to the attention of the legislative authorities it was decided to draft a tentative form of a complete law for the registration of deaths, making provision for all of the details of the work under the system of state registration advocated, and capable of being adapted to the local constitutional requirements and administrative methods.

To enlist the assistance of all persons interested in securing such legislation or in carrying it into practical effect, a series of circulars was prepared which have been printed and widely distributed by the Census Bureau. Considered in order, they are:

No. 100. On "Legislative Requirements for Registration of Vital Statistics," containing the resolutions adopted by Congress and the American Public Health Association, the paper of the committee on "the essential requirements of a law for the registration of deaths and the collection of vital statistics," and a specimen draft of an adequate law, drawn in accordance with the principles laid down by the committee, with the form of standard certificate recommended. This circular has been sent to the governors of all states that do not now have an effective system of registration.

No. 101. On "Practical Registration Methods," designed for the guidance of local registrars. This describes the "standard certificate" and explains the necessity and use of the various details required concerning each death; outlines a simple system of filing and preserving the records and of making returns to state officials; gives the titles of the international classification and explains the relation of causes of death, as reported, to classification for statistical purposes. It also gives a list of indefinite or unsatisfactory terms frequently used by physicians in reporting deaths, with explanatory notes showing what further information should be required in such cases.

No. 102. On "Relation of Physicians to Mortality Statistics." This circular is issued for the use and benefit of physicians who have to make out certificates of death in compliance with registration laws, by acquainting them with the scope and requirements of the international classification, which has been adopted by all of the registration states and by most of the principal registration cities for the compilation of their mortality statistics.

No. 103. On "Medical Education in Vital Statistics," gives a synopsis of the circulars previously described; explains the movement for the extension and improvement of registration data and statistics upon uniform lines, and suggests to medical colleges and schools the desirability of initiating a course of instruction for students upon registration methods and vital statistics.

All of the circulars, and the "Manual of the International Classification," which was presented at the last meeting, relate to different phases of the same general plan. By means of them, it is sought to convey to all persons interested a comprehensive knowledge of the details of the plan and of their relation to the same, in accordance with the ideas and opinions of the experienced registration officials and statisticians who have joined in the movement. The Census Bureau has assumed the labor and expense of preparing, printing, and distributing these documents, and of the correspondence incidental thereto, so as to enable all those interested to get together and to coöperate effectively in the movement for uniformity and accuracy.

The circular on "Practical Registration Methods" has been sent to all registration officials, who had all been previously supplied with the "Manual of the International Classification," that on the "Relation of Physicians to Mortality Statistics" has been sent, to date, to about 87,000 physicians, and that on "Medical Education in Vital Statistics" to all medical colleges and schools. Copies of these circulars have also been sent to all state medical societies, medical journals and others interested, and the demand for them has been such that a further edition will be necessary for some. Wherever sent they have been cordially

received and commended, and the opinion has been universally expressed that their distribution will contribute most decidedly to improvement in the character of the returns. It is particularly gratifying to note that the circular to physicians has met with their approval as being specially helpful in making their certificates more satisfactory and valuable.

Replies received from governors of non-registration states show that most of them favor the legislation suggested and several have announced that they would recommend such legislation at the next session of the state legislature. The movement has already produced practical results in Florida, Georgia, Iowa, and Wisconsin, where laws are being drafted for introduction, and the committee is assisting the local people in the construction of suitable measures. A close watch is being kept upon the situation and development in all of the states and the committee stands ready to render any assistance necessary.

In initiating the movement by publication of the circulars on "Legislative Requirements" it was the conclusion of the committee that the efforts should be limited, in the first instance, to registration of *deaths,* as being more easily controlled, leaving the registration of births to be provided for subsequently, — when the state registration service should be fully established and in effective operation, but the developments indicate a general desire to include both, and the committee has therefore drafted a law for the registration of births and formulated a "Standard Certificate of Birth," to be recommended. The circular covering these features (No. 104) is now in press. It will contain the draft of a separate law for registering births, also the draft of a combined law for both births and deaths, and a copy of the "Standard Certificate of Birth" with an explanation of the purpose and use of the details called for therein, and considerable information for local registrars. In addition to the two drafts of laws specified, which are very specific in their provisions and cover about all of the features of the work under the system advocated, a third draft of the combined law in a condensed form is given for use where certain details may be legally required under the rules and regulations which the state registrar is specifically empowered "to make, promulgate and enforce."

The movement was brought to the attention of the American Medical Association at its annual meeting in May last, and that organization promptly passed concurring resolutions and authorized its committee on "Public Health" to coöperate in the work.

Continuing the work relating to the classification of causes of death, and the presentation of tabulated statistics in the annual reports and monthly and weekly bulletins of the registration states and cities, which was directed by the resolution adopted at the last meeting, a plan was

formulated for the treatment of cases in which two or more causes of death are assigned, by a system of numerical rating adaptable to the alphabetical index of single terms given in the Manual of the International Classification. This plan was communicated to a number of statisticians and preliminary ratings obtained and studied; and a circular describing and illustrating the plan has just been issued by the Census Bureau. This circular (No. 105) on the "Statistical Treatment of Causes of Death" will be sent to all persons whose assistance will be valuable in determining satisfactory ratings for general purposes.

To assist in studying the question of the most desirable series of tabular statistics to be recommended for use in the published reports and bulletins of registration states and cities, a complete collection has been made of all forms of tables containing vital statistics that appear in the reports now published. These have been collected, classified, and annotated by the Census Bureau, and turned over to the coöperating committee of the Conference of State and Provincial Boards of Health, as the resolution to undertake this work originated in that body. The conference also decided, at its annual meeting at Baltimore last week, to include the standard certificate of death as a part of the transit permit, prepared for use in all parts of the United States.

In considering the general results of the movement, it may be said that the prospects are very bright for a considerable extension of the registration system in new states upon proper lines, and for a similar improvement in the character of the data recorded. Many of the present registration states and cities have already adopted and put into use the standard certificate of death, and have made changes in their methods in line with the system advocated — all of which contribute to uniformity, accuracy and availability. To insure the enactment of adequate laws in many other states it is only necessary for the health officials, medical societies and individuals interested in each state to unite in some definite plan of action, and to appoint energetic committees having a practical knowledge of the way to get things done, and thus bring their influence to bear upon the legislative authorities. A general sentiment or agreement that something *should* be done has no force until it is capably directed.

The efforts of this committee and the coöperating agencies in this direction must necessarily be of a general nature until the local agencies have formulated their plans and need specific assistance, when it will gladly be rendered.

SOME INDICATIONS THAT MAY SERVE FOR THE BETTER UTILIZATION OF THE RESULTS DERIVED FROM A COMPARISON OF THE PRINCIPAL CAUSES OF DEATH IN THE CITIES THAT APPLY THE INTERNATIONAL NOMENCLATURE.

By Dr. J. E. MONJARAS, Mexico, Mexico.

At the request of Mr. Wm. A. King, chairman of the special committee on "Demography and Statistics in their Sanitary Relations," I now have the honor to submit to the study of the learned members of this society, certain points that may be of service for the better utilization of the results of the comparison between the principal causes of death in the cities which make use of the international nomenclature that has been introduced by the eminent statistician, Dr. J. Bertillon.

Nobody can to-day doubt the importance of statistical data, which, of all the branches of knowledge, has so greatly contributed to the study of human nature. It exercises an important influence on agriculture, industry, trade and science in all its branches.

The most important reports relating to the actions of men, which are now admitted by everybody as unquestionable truths, are derived from these statistics.

It is based on an immense collection of facts collected from all parts of the globe, expressed in the clearest language and in the form of arithmetical tables which are prepared by an official staff that has no previous theories or prejudices with respect to those facts, and consequently, is in no way interested in altering the truth of them, or in the form in which they are presented.

The data that serve for the formation of the statistics, become more valuable in proportion as they are collected with increasing uniformity, which renders their comparison easier and less liable to error. This uniformity ought to exist, not only in each individual country, but also in all countries in general.

Statistics throw a light on the most difficult and important social problems, and for this reason, all nations endeavor to make use of that light. But the importance of their results demands that all nations should agree on a common action, or in one word, statistics ought to be international in character. This is the reason why the most advanced nations in the world have already adopted a uniform system of nomenclature for disease and death, and this Association

has taken an important part in this great and beneficent work, that gives such splendid results for public hygiene, the principal object with which our Association brings together the eminent and learned men, who in a great part of our continent occupy themselves with this science, that now controls everything, protects human life, lengthens it and renders it more perfect and agreeable; whose splendid ambition it is to suppress disease, to convert drugs into a poison for our enemies; to depopulate the hospitals and utilize cemeteries only for those persons who die of old age or unavoidable accidents. This ideal constitutes our program and it is the sense of our obligation to work for its realization that has brought us in this meeting. But it is not enough to have adopted the same system of nomenclature; it is necessary that the results obtained in each country, should be collected simultaneously from time to time, and that we should employ similar definitions, methods and tables. It is necessary that the statistical data should be circulated among all nations as soon as possible, in order that the hygienic laws indicated by those data, should be promptly understood and enacted, and that steps should be taken to defend the inhabitants of a country from any other that is infected, and such laws or regulations be promptly applied.

For this purpose each nation ought to publish a weekly, monthly, quarterly and annual bulletin, in which we would find recorded the last census tables, the meteorological data, those relating to births, marriages and deaths; the cases of transmissible disease, the measures taken to combat them, etc.

Bulletins of this character are already published in some countries, and I have published mine for more than ten years past. (Copies of bulletins were presented with paper.)

In order to arrange these bulletins, it is necessary to commence by obtaining the most perfect uniformity possible in the medical certificates, and in the event of the physicians being too negligent to furnish these data in a proper form, it becomes necessary to apply to the registry offices for copies of the registers which contain the information that has been omitted by the physician.

These first data ought to be received, revised and carefully collected in the statistical office, in which the bulletins above mentioned should be edited, avoiding all interference on the part of any person who has not the necessary experience and knowledge of such work. In some countries, the political authorities are charged with part of the collection, but these agents ought to be eliminated and the statistical service properly centralized.

In some countries the physicians are opposed to giving complete information as to the cause of death, on account of their obligations

to preserve professional confidence. This is a conscientious scruple that it is undoubtedly desirable to respect provided that it is not to the prejudice of public health, and in such case, the medical certificate might be given in such a way as to leave it to a certain extent anonymous, or in other words, the desired information could be supplied without giving the name of the deceased person. At the same time, I repeat that professional confidence must never be allowed to obstruct the free application of the measures which are intended to prevent the propagation of transmissible diseases.

In the cases of patients who have died without medical attendance, the cause of death ought to be proved by a post-mortem examination and the information that could be furnished by the relations or friends of the deceased; but under no circumstance should the burial permit be issued without a medical certificate that will show the cause of death.

In order to render these statistical data more exact, care should be taken in the collection that has to serve for the editing of the bulletins, and dedicate to them three columns, as I do in mine; one showing the deaths that have occurred in private houses and with medical attendance, another for those that have been attended in the hospitals, and another in which no medical attendance has been received. There can be no question that the diagnosis made in the hospital will generally be more correct and precise than that made by the physicians in private practice, and both will be more exact than those which are made after a simple examination of the body in a private house.

In view of the above arguments, I have the honor to propose that this Association adopt the following resolution:

Resolved. The American Public Health Association recommends that all the countries which employ the demographic statistics of international classification for diseases and deaths, should publish four bulletins, which would be weekly, monthly, quarterly and annual, similar to those which are published in Belgium.

REPORT OF COMMITTEE ON DISINFECTION AND DISINFECTANTS.

By Prof. F. C. ROBINSON, Chairman, Brunswick, Me.

Your committee has tried to become acquainted with any new matter bearing on the subject of disinfection and disinfectants which has appeared since the last meeting of the Association, with the purpose of presenting it with any comments we might make to you at this meeting. We now report that while nothing startling has come to our attention, several things of practical interest have been accomplished and substantial gain has been made both in new material and ways of using the old. Disinfection has become more and more a scientific matter to be used with discrimination and care. Its limitations are more clearly seen than ever before, and, as was to be expected, it has become apparent that there is no one simple method of effectively treating all problems of disinfection any more than there is of treating all diseases. Many are already seeing what in time will become apparent to all that it is much better to so arrange things connected with infectious diseases that a minimum of disinfection in the ordinary sense will be needed; in short, that cleanliness and care are the best disinfectants and when properly used may need no supplement.

Nothing new has been established in reference to room disinfection. Since the knowledge was obtained as to how great a share in the spread of infectious diseases lower forms of animal life have, disinfection which will destroy such life has become a matter of importance; and because the fumes from burning sulfur are found to be especially active in this regard there has been a revival of its use. This revival has been helped much by the publication, a little more than a year ago, of the experiments of Dr. Geddings of the Public Health and Marine Hospital Service, in which he clearly shows, what has been claimed before, that while dry sulfur dioxid is not an active agent to destroy bacteria yet sulfurous acid is, that is, sulfur dioxid combined chemically with water. His pamphlet on the subject has been seen probably by most health officers, and is so accessible that no repetition of his work need be made here.

Of course nothing that has been done corrects the one great disadvantage in the use of sulfur in dwelling house disinfection, its destructive action on the furnishing of such rooms.

In reference to formaldehyde, conditions are about as last year. The laboratory of the State Board of Health of Ohio has done good work

in showing up by its experiments another of the widely advertised inadequate methods of using it, by vaporizing a little paraform. Dr. Hill of this committee has continued the experiments he gave a preliminary account of at the meeting last year on the vaporization of formalin by means of steam.

His experiments agree with all others that moisture and heat are great factors for efficient action of formaldehyde.

In the foreign journals some interesting articles have appeared on this and other branches of the subject. In England several forms of apparatus have been brought out for using formaldehyde. It is significant that several use steam and a high temperature with the formaldehyde.

One patent is on a mixture of formaldehyde solution with certain organic acids as formic, citric and others of that class, and certain aromatic oils also, which are claimed to increase greatly its germicidal powers. This claim certainly seems reasonable from a chemical standpoint.

Another of these patents is interesting from the fact that it combines sulfur disinfection with formaldehyde, providing for the volatilizing of the formalin by means of heat from the burning sulfur. It would be interesting to know how successfully this acts considering the fact that formaldehyde and sulfur dioxid combine chemically with each other to a certain extent.

In Germany and France several articles have appeared on formaldehyde. Perhaps the most interesting is that by Carl Spengler of Davos who gives a long series of experiments first showing how formaldehyde added in considerable amount to culture media containing tuberculous sputa not only did not destroy the bacilli, but seemed even favorable to their growth. It would destroy all other bacteria present and leave pure cultures of the bacilli in question. He followed these by experiments on room disinfection using the apparatus first used by Flügge of Breslau, in which paraform pastilles were vaporized in an atmosphere containing plenty of water. His results were so generally negative that he concludes that such disinfection is of little or no value against tuberculosis, and of very limited value in other cases.

In the same journal Flügge makes a brief answer to this claiming that Spengler used a method long since discarded, and saying that in Breslau formaldehyde disinfection is the chief one used. He called Spengler's attention to the fact that he and others had made no claim that penetration of the gas could be obtained into masses of sputa or other such things, but had always claimed that other means must be used with it for such cases.

In another article Esmarch shows by experiment that steam disinfection is much improved if about two per cent. of formaldehyde be present in the water boiled. This gives much greater penetration in a far shorter time.

About twenty years ago Koch and others showed that hot air was an efficient disinfectant, but only at temperatures of 140° C. which made it impracticable on a large scale. But now Schumburg shows that if the air have a humidity of 55-65 its disinfecting action is so increased that all bacteria are killed by it at 100° C. It has many advantages over steam for certain cases, as where leather and such like things are present steam injures them, while hot air at the same temperature does not.

A most interesting article by Simon shows that common carbonate of soda which earlier work has shown to have little destructive actions on bacteria unless in very strong solution, at common temperature, has very great action at higher temperatures. Even a two per cent. solution at 60° C. will kill all bacteria tried, including B. tuberculosis, in from two to five mintues.

Another interesting article shows that tobacco smoke not only does not destroy bacteria, but actually increases their vitality and aids in their multiplication.

It has long been the hope of health officers that some protective substance might be discovered which could be put on the walls of living rooms, and by its inherent properties keep the room free from infection, make it self-disinfecting so to speak. Indications that this is possible have been seen by those who have noticed that cultures of bacteria live longer on certain supports than others. Some of these facts were brought out in earlier reports of this committee, notably at the Ottawa meeting.

Now certain experimenters, and most recently Lydia Robinowitsch, publish results showing that some of the pigments on the market are almost the ideal substances hoped for. She shows that one or two kinds of enamel paint used for interior work are so germicidal that cultures of very resisting bacteria, including tubercle, attached to them are killed in four days. It is to be hoped that other paints may be tested in a similar way as soon as possible. The action seems to depend upon the composition of the pigment rather than the oil or any physical action.

But perhaps the newest and most important work of all has been the development in Germany of the purification or disinfection of water by ozonized air. The committee on water supplies may regard it as within their province rather than ours to describe the process and I gladly yield to them in the matter, simply saying on our part that it

seems to be so much of a success that already several large cities have erected plants which are working successfully in the application of it.

Ozone, as all know, is what may be called oxidized oxygen, and the excess of oxygen in the molecule is readily given off, and in the atomic or active condition in which it plays its part as a disinfectant. Air is first ozonized by action of the silent or brush discharge of electricity and then made to bubble through the water. Experiments show that by regulating the flow of water and air the water can be rapidly and continuously sterilized, and nothing be left in it of the ozone except a slightly higher percentage of oxygen, which in itself is an improvement.

We venture to predict that some application of this principle can and will be applied to room disinfection. If some practical ozonizer could be prepared utilizing perhaps the house current of electricity which is now so common, what a gain it would be! The disinfector with his chemicals would then give place to the electric machine to the benefit and certainly the comfort of all concerned.

A list of references to articles is given for those interested to get further details.

ARTICLES ON DISINFECTION SUITED FOR THE REPORT.

Zeit. für Hygiene und Infections.

March, 1902. Schüder. Concerning Hünermann's experiments on water disinfection.

Reichenbach. Experiments on disinfection of railway carriages with formalin.

Schumburg. Water purifying with bromin.

Pfuhl. Remarks on Schüder's articles.

July, 1902. Wirgin. The action of alcohol on micro-organisms.

August, 1902. Lydia Robinowitsch. Disinfecting coatings for walls.

October, 1902. Schumburg. The disinfecting action of hot air.

Schüder and Proskauer. Disinfecting of water by ozone.

January, 1903. Spengler. Action of formaldehyde on tubercle bacilli in culture media and in infected rooms.

Flügge. Remarks on Spengler's article.

Hesse. The killing of tubercle bacilli in milk warmed to 60°.

February, 1903. Schüder and Proskauer. Further experiments in water purifying by ozone.

June, 1903. Simon. Disinfecting action of warm soda solution.

Centralbl. für Bak. Parasit. und Infections.

August, 1902. Purifying of drinking water with chloride of lime and bromin.

Ohlmuller and Pratt. Treatment of water with ozone.

February 14, 1903. Esmarch. Action of steam containing formaldehyde in disinfection.

February 17, 1903. New apparatus for disinfection.

March 20, 1903. Eijkman. Why steam at the same temperature is better disinfecting substance than water.

Kokubo. The disinfecting value of certain formaldehyde preparations.

April 4, 1903. Engels. Disinfection of the hands.

May 14, 1903. Engels. Action of disinfectants dissolved in alcohol.

Abba and Rondella. Corrosive sublimate and formaldehyde in practical disinfection.

Bulletin No. 3. Hygiene Laboratory, Washington, D. C. Geddings. Sulfur dioxid as a germicide.

Bulletin of Ohio State Board of Health. August, 1902.

Journal of State Medicine, London.

April 1902. Experiments on Disinfection. (Nothing of importance brought out not already known.)

Revue d'Hygiene, Paris.

February, 1902. Dopter. "Disinfection by means of weak formal solution used as spray." (Gets good results by spraying into a room 2.5% solution of formalin in water, and keeping closed for 24 hours.)

October, 1902. Calmette and Hautefeuille. Report on disinfection. (Regards 8% SO_2 made by burning sulfur and 24 hours action as perfectly safe for ship disinfection.)

May, 1903. Calmette and Rolants. The value of sulfurous acid as a disinfectant. (Shows that the action of sulfurous acid depends upon the presence of some sulfuric and that the pure dry gas will not disinfect. Thinks 8% in air maintained for two hours and allowed to act 24 hours generally effective.)

June, 1903. David and Durian. Disinfection of ships. (Compares carbonic acid with sulfurous for this purpose and decides that the latter is better.)

DISINFECTION IN MEXICO.

By Dr. L. E. RUIZ, Mexico City, Mexico.

The agents employed in disinfection at the present time in Mexico are, as in other places, physical forces and chemicals.

For disinfection of bedding, clothes, hangings, etc., not silk or leather, steam at 115° C. and fifteen minutes' exposure in closed apparatus is much used.

A 1-2 in 1000 solution of bichlorid of mercury is used as a spray, in rooms, and for a wash for human beings, and for clothing, etc. Of course all metallic articles which would be injured must be covered by some protecting coating as asphalt varnish. This is also used for closets, drains, etc., and for small vessels excepting those to contain fruits and foods.

Lime solution 1-4 is also used for walls. The fumes of burning sulfur are used for room disinfection, 30 grams to one cubic meter. Precautions are taken in the use of sulfur to have the room as close as possible, and the air well moistened. The action should continue for from 12 to 24 hours before airing the room. Formaldehyde is used to a certain extent, mainly where other agents mentioned would damage the things to be disinfected.

Prussic acid is beginning to be employed, both as an insecticide and disinfectant according to methods described by Dr. Fernando Lopez. He uses from 1 to 20 grams of potassium cyanide per cubic meter of space to be disinfected, liberating the acid by using dilute sulfuric acid.

EXPERIMENTAL STUDY OF HYDROCYANIC ACID AS AN INSECTICIDE.

By Dr. FERNANDO LOPEZ, Mexico City.

To contend against the propagation of infectious diseases, practice has been made of the means known as disinfection with the object of destroying the pathogenic germs which are found in dwellings and in infected objects. The knowledge acquired in these last years, has demonstrated the fact that many infectious diseases are not directly propagated, but that the germs must pass through the body of an animal, which acquires them by sucking the blood of a sick man or animal, acquiring in this way the terrible property of transmitting them by biting other healthy men or animals. This is the case with yellow fever, malaria, — and filariasis which are propagated by medium of the mosquitoes, and the bubonic plague by medium of fleas.

It will be easily understood that in these cases, the disinfection which has been used until late years was absolutely insufficient. No benefit whatever is derived from disinfecting objects and places, if you continue to let the mosquitoes and fleas bite persons who are ill; these animals escaping in various ways to parts more or less distant, propagate these diseases and develop epidemics. The struggle against them at the present state of our knowledge, does not consist altogether in disinfection, as it was hitherto admitted, but in certain diseases it is necessary to carefully guard the sick from the attack of insects, and to destroy the animals susceptible of contracting said diseases. The rats and mice in the bubonic plague not only infect the fleas, but serve as a vehicle for propagating the disease even to remote parts.

Another method consists in searching for and destroying the insects, whether they be found in a larval or adult state, and to contend by means of hygiene, so that places favorable to their multiplication will not exist, and lastly to employ means to protect the healthy man from the bites of the said animal.

At present it has been proved that insects can propagate diseases, not only in the manner which we have here indicated, but as serving simply as a vehicle to the many organisms. A fly settling upon the spittle of a tuberculosis patient, or upon dejecta containing the bacillus of typhoid fever, or of cholera, or upon a cancerous ulcer, etc., etc., may directly, or through his food, infect a man.

As hydrocyanic acid is a very powerful insecticide, and but little known as yet, I have thought it of interest to present the results of some experiments which I have made with this agent.

Hydrocyanic acid is a colorless liquid whose boiling point is 26 degrees. This acid, at an ordinary temperature becomes gaseous and has a marked odor of bitter almonds. It may be obtained in many ways, but the cheapest and most practicable, consists in mixing two parts of diluted sulphuric acid with an equal quantity of water and pour this upon a portion of commercial potassium of cyanid. In order to dilute the sulphuric acid, it is necessary to pour the acid little by little into the water, never to the contrary, stirring it continually, using vessels which will not break under the influence of an increase of temperature which is produced by the reaction. Owing to the many impurities contained in the commercial cyanid, not all the substances are useful in the reaction, more so when the carbonic acid of the air displaces little by little the hydrocyanic acid, transforming the cyanid into carbonate.

For this same reason it is necessary to assay the salt which is to be employed, in order to know the impurities it contains, which are of very little importance, except to calculate the quantity of cyanid. The procedure of Fordos and Gellis is the easiest and most practicable for making this assay. Dissolve fifty centigrammes of the salt which is to be analyzed in a little water, add one hundred and eighty cubic centimeters of gaseous water, in order to saturate the potash which may be free, and complete the liter with distilled water: put little by little into this liquid by means of a burette graduated in cubic centimetre, a solution of ninety-six centigrammes of iodine in twenty seven grammes of alcohol.

If the assayed cyanid is pure it will absorb the twenty-seven grammes of the solution of iodine before coloring, but if the coloring is obtained before pouring in all the iodine, the cyanid contained in the salt which is assayed is proportional to the volume of the solution of iodine employed. In order to make the proportion, it is enough to add two ciphers to the number of cubic centimeters of the solution of iodine, which was necessary to entirely color the solution of cyanid and to divide the quantity produced by so much per hundred of the cyanid contained in the assayed salt by twenty-seven.

Example — If thirteen and one-half cubic centimeters of the solution of iodine are required to slightly color the solution of cyanid, divide 1350 by twenty-seven, giving us fifty which is the quantity of cyanid contained in one hundred grammes of salt. Commercial cyanid contained on an average of 70% of the said salt, and it is this strength which we have used in our experiments. As it may be possible to find a smaller proportion, it is preferable to always make the assay in order to know the quantity of cyanid with which we deal. Hydrocyanic acid is a very dangerous liquid to the life of man and of

animals. A man may die from 0.10 centigrammes of liquid hydrocyanic acid, and special attention is called to the rapidity with which animals subjected to the action of the said acid die. The terrible properties of this gas makes it a useful agent for destroying the animal plagues which annoy or damage man, such as bedbugs, flies, mosquitoes, cock-roaches, moths and diverse agricultural plagues, etc., etc. Whenever this gas can be used in a closed space upon the said animals, their destruction is rapid and sure, but it should never be forgotten that a double-edge saw is being used which may also cause the death of other beings if they don't flee from its sphere of action. Before the evolution of the hydrocyanic acid one should be careful to put out all the lights which might inflame it, for from my personal experience this accident may happen. In fact, having a certain quantity of hydrocyanic acid beneath a crystal globe, beneath which was also a lighted candle, may be seen to burn equally as the evolution takes place, forming yellow flames. Although the gas which we study is not inflammable, except in large proportions, it will not prove useless to take all kinds of precautions in this case.

With the object of having a clear and precise idea of the poisonous action of hydrocyanic acid I made a series of experiments in the disenfectant department of the Military Hospital of Instruction, utilizing a room whose capacity is seventy-six centimeters and which is separated from the adjoining room by a large glass which permits one to observe without danger from what happens within.

1st. Experiment.— Some large flasks were placed upon the table, containing fleas, mosquitoes, flies, chinches, lice, cock-roaches. A medium sized dog was also placed in the room, together with some rats and mice. With the evolution of the hydrocyanic acid, which employed twenty grammes of cyanid of commercial potash and forty grammes of sulphuric acid to each cubic metre, I shut the door violently and covering the crevices with strips of mucilage paper, went to the adjoining room to watch the result from behind the glass. Before a minute had passed the dog began to manifest restlessness, and was attacked shortly afterwards with convulsions and with emission of urine which violently interrupted the respiration. The animal having died at the end of two minutes. The rats and mice offered a greater resistance, but died between six and eight minutes. Fleas, lice, chinches and cock-roaches were apparently in a dying state at twenty minutes, and at the end of half an hour were taken out dead; the flies and mosquitoes died between four and five minutes.

2nd. Experiment.— Employing fifteen grammes of cyanid to the cubic metre of capacity, I observed the death of a medium sized dog in eight minutes; rats and mice between ten and fifteen minutes; fleas,

chinches, lice and cock-roaches in half an hour; flies and mosquitoes between ten and fifteen minutes.

3rd. Experiment.—Employing ten grains of cyanid to the cubic metre, I observed that a medium sized dog died in fifteen minutes; the rats and mice between fifteen and twenty minutes, these latter offering greater resistance. Of the chinches, lice, fleas and cock-roaches, which were taken out in an apparently dying state, many returned to life, after an hour's time.

4th. Experiment.— Employing five grains of cyanid to the cubic metre, I observed that a medium sized dog died in fifteen minutes. The rats and mice at the end of thirty minutes were taken out in an apparently dying state, some of which returned to life after remaining in open air; the flies between fifteen and twenty minutes. Mosquitoes taken out after half an hour's time in an apparently dying state nearly all returned to life. The chinches, lice and cock-roaches and fleas did not show signs of intoxication. A cat which was also subjected to this experiment, was the first to die in eight minutes' time.

5th. Experiment.— Employing two grammes of cyanid to the cubic metre, a dog subjected to this experiment had only some convulsions; the rats and mice showed no sign whatever of poison; the flies died in half an hour's time; the mosquitoes resisted almost all, but some of them were in an apparently dying state.

6th. Experiment.— Employing one gramme of cyanid to the cubic metre, and after half an hour's time the flies alone were dead.

As is to be seen from this series of experiments, the chinches, lice, fleas, and cock-roaches offer some resistance to the hydrocyanic acid poison, coming after the rats and mice and mosquitoes, dogs, cats and lastly the flies, which are extraordinarily sensitive to this gas. It may be stated, therefore, that when wishing to destroy chinches, lice, fleas and cock-roaches, no smaller quantity than twenty grammes of cyanid to the cubic metre should be used, prolonging its action from six to eight hours in order to obtain a satisfactory result. For the rats and mice fifteen grammes of cyanid to the cubic metre from four to five hours; for the mosquitoes ten grammes should be used to the cubic metre from four to six hours; and for the flies it is sufficient one gramme to the cubic metre, for one hour. In these series of experiments we were able to observe the rapidity with which this gas escapes when a door is opened; after half an hour's ventilation the odor of the gas cannot be perceived at the door through which it escapes and a dog introduced into the room, does not manifest the slightest inconvenience. An hour's ventilation, opening several doors and windows, is enough to free one from all danger.

The poisonous action of hydrocyanic acid has been utilized for the destruction of agricultural plagues and those which infect dwellings, especially in the United States, where Doctor L. O. Howard has made some interesting studies, which give a knowledge of all the advantages to be derived from this agent. Comparing the studies which have been published by the Agricultural Department of the United States, we have applied this agent in Mexico City for destroying plagues in the dwellings, and I wish to set forth the result of these experiments in this humble work.

When one desires to use the gas in a dwelling it is necessary to subject it to rigorous and invariable rules — in order to prevent the loss of human lives or of domestic animals, — the first condition which should exist is that all of the inhabitants should be forced to leave the house during the time it is applied, and that the same precaution be taken with the horses, dogs, birds, etc., either removing them from the house, or putting them in a place which may be deemed safe by the experimenter. Exceptions to this rule can be made only, in cases where a part only of the house is to be disinfected and where the rooms are entirely separated from the part to be disinfected, and where the family may take refuge. But in these cases it is necessary to have a watchman during the time the gas remains, in order to prevent any one from entering the room. Some might enter through ignorance or through lack of faith, jesting at the precaution, and expose themselves to the deleterious action of the gas. A short time ago, upon applying the hydrocyanic acid in a kitchen and dining room of a house to kill the cock-roaches, which had multiplied in great quantities, the members of the family remained at a safe distance in other rooms of the same house. They began, however, to open the doors and to take out the dead cock-roaches, ridiculing the orders which had been given for no one to come near the doors, which had been barricaded with chairs and empty drawers. In this case to which I refer, when the individual who had charge of the ventilation reproached the family for their procedure, they replied that they were well acquainted with that substance and that it was not as dangerous as it was said to be, that although it killed the cock-roaches, which was evident from the number which lay dead on the floor, that it had no effect whatever upon man. A careful examination should be made of the rooms in which the gas is to be exposed to make sure that there are no rat-holes or openings through which the said gas may escape, first named should be obstructed with damp cloths and second with strips of mucilaged paper. The windows, chimneys and stove-pipes should be treated in the same manner, closing all the doors and windows, covering all cracks with strips of mucilaged paper, leaving only one door

open through which the individual performing the operation may escape, which after his exit, should be closed in the same manner as the others. When you are dealing with a house of more than one story, the gas should be set free in the top story to insure greater safety, owing to the fact that hydrocyanic acid is lighter than air. In the experiments which I have made to determine the action of hydrocyanic acid upon different objects, I have subjected pieces of metal, delicate colored materials, photographs, etc., to the action of the said gas beneath a crystal globe, observing that they underwent no alterations whatever, although the contact was prolonged for several hours. For this reason nothing should be removed from the interior of the rooms; all kinds of provisions and drinks which may retain a certain quantity of the poison and afterwards give place to accidents, should by all means be removed. For the evolution of the gas Doctor L. O. Howard advises that the cyanid be enclosed in thin paper packages (thick paper would impede or would make the reaction difficult) which are to be thrown into the flask containing the sulphuric acid and that the individual performing the operation should leave the room instantly; or that the package of hydrocyanic acid should be suspended by a thread which passes over a pulley, lowering it upon the sulphuric acid from a more or less distance. In the experiments which I have made, I have found the first very simple and practicable, and permit me to recommend that tarlatan bags be used instead of the paper bags, which some times offer a great resistance to the penetration of the liquid, the tarlatan bags permitting the reaction to begin immediately.

I have never used the second process, believing it not to be very safe. In every case the sulphuric acid should be placed in flask of a sufficient capacity to prevent a great effervescence during the reaction, causing an overflow of the liquid — care should also be taken to protect the floor with large pasteboards or papers.

When a larger quantity of cyanid is used the reaction may prove dangerous, as I have already said. For these cases I have thought out a process which I put in practice when destroying an insect plague which accumulated in the wood-work in the dining-room of the National Palace of Mexico, which began to destroy the ceiling and the furniture, which are works of art. The said dining-room contains a capacity of a little more than one thousand cubic metres, requiring 15 kilogrammes of cyanid. The process consists in placing the salt with a little water in a porcelain cask of sufficient capacity, and the sulphuric acid conveniently diluted in another cask which has a faucet. Place a porcelain or enameled iron vessel in the mouth of the first cask, holding it in place by wires, giving it a slight inclination so that

the liquid poured into it will run into the interior of the cask; place the cask containing the sulphuric acid upon a table so that the faucet will be in the air; place the second cask on the floor so that the vessel attached to its mouth will be just beneath the faucet. Having prepared everything in this way and the time comes to verify the reaction, calmly turn the faucet so that the solution of sulphuric acid will fall on the small vessel and run into the cask containing the cyanid. It is easily understood that by using this artifice there will be plenty of time to escape from the action of the gas and to complete the operation with calmness and surety.

To ventilate the houses after the gas has remained the necessary time to have destroyed the plague, care should be taken to open a window or door from the outside, which will be less dangerous, so that the gas escaping through it will not penetrate other houses which are very near or higher than the first. Care should always be taken to advise the adjoining houses so that they may keep the windows and doors shut that might offer danger.

The gas should be permitted to escape through the chimneys or ventilation tubes, when such exist, as it is less dangerous for it to escape through the roof. One hour's ventilation through an open door is sufficient to enter the room, hastily throwing open all the doors and windows, after which all danger will disappear.

I advise the employment of hydrocyanic acid to exterminate mosquitoes in railroad cars as the most efficacious means yet employed.

The facility with which the gas is obtained — the promptness of its action and the advantage that it will not tarnish the polish of the metals nor discolor the fabrics, however delicate they may be, constituting an estimable agent for the disinfection of railroad cars, especially against propagation of yellow fever.

From the personal experience which I have acquired in the use of hyrocyanic gas, I deem it profitable for the destruction of insects, rats and mice in the ships, these owing to their special isolated conditions, and owing to the facility with which they may be disinhabited in a moment's time, offer great advantages for the use of said gas. As at present, very frequent use is made of insecticides to prevent the propagation of the bubonic plague, yellow fever, etc. I believe that hydrocyanic acid, with all its advantages which I have enumerated, should be carefully studied in order to minutely establish the technique which ought to follow it, giving the special structure of the vessels.

REMARKS ON THE PREPARATION OF VACCINE VIRUS.

By Dr. JOHN F. ANDERSON,

Passed Assistant Surgeon and Assitant Director Hygienic Laboratory, U. S. Public Health and Marine Hospital Service, Washington, D. C.

In a paper read before the New York Academy of Medicine in February, 1902, Dr. M. J. Rosenau, Director of the Hygienic Laboratory, of the U. S. Public Health and Marine Hospital Service, called attention to the fact that much of the vaccine then on the market showed a high degree of microbial contamination. He attributed this to the fact that many of the manufacturers, on account of the great demand for vaccine, were placing their product upon the market "green," or too soon after the collection from the calves and before the glycerin had exerted its full germicidal action.

In a more complete study, the results of which were published as Bulletin No. 12 of the Hygienic Laboratory, he emphasized this point and showed that too much dependence had been placed by manufacturers on the germicidal action of glycerin.

The germicidal action of glycerin is feeble. It probably acts by virtue of its great affinity for water, which it abstracts from the germ. Its germicidial action is much greater at the temperature of the body than in the ice chest. Pus cocci are killed by it in the incubator in two weeks, but live for months in the ice chest. Rosenau states that it asserts its greatest germicidal action in the first 24 hours, that the bacteria of the colon group are markedly resistant to its action and that it has practically no effect upon spores.

Copeman in 1891 originated the idea of preserving vaccine pulp with glycerin. He claimed that it not only exerted an antiseptic action on the bacteria found in bovine virus, but that it gradually destroyed those contained therein.

The Act of Congress approved July 1, 1902, entitled "An Act to regulate the sale of viruses, serums, toxins, and analogous products in the District of Columbia, to regulate interstate traffic in said articles, and for other purposes," and regulations approved in accordance with said Act, imposed upon the Public Health and Marine Hospital Service the inspection of establishments manufacturing vaccine, serums, etc. Commissioned medical officers not below the grade of passed assistant surgeon are to make the inspections.

The recent inspection of establishments was made by two officers detailed for that purpose by the Secretary of the Treasury. The inspectors were received with courtesy by all of the manufacturers and

every facility given them for as thorough an inspection of their plants as possible. Some of the plants were found to be conducted most excellently; stables and barns constructed according to the highest sanitary requirements, care and feeding of the vaccinated calves all that could be asked; methods of collecting and preparing the virus conducted with as great attention to prevent accidental contamination as is possible in the handling of such a substance as vaccine virus.

I am sorry to say that some establishments were not so conducted. I think I may, with benefit to all, give in a few words some of the most notable faults, that were found. The barns where vaccinated calves were kept were, in some cases, simply a portion of the building partitioned off, horses in some instances being kept in the other part of the building, either for the production of antitoxin or for general use. The close proximity of horses was an added source of danger of tetanus contamination. The floors often were of wood, soaked with the discharges from the animals, and not properly sloped and guttered. Although summer, the windows were not screened in some instances. When the pulp was to be taken the site was flooded with ordinary tap water and then the pulp was scraped off with a curette and put into an unsterilized container. The pulp was weighed, mixed with the proportion of glycerin used by the manufacturer, ground and then placed in the ice chest until it was desired to be put in the tubes or on the points for marketing. The methods of sterilization of the points, tubes and other containers were often crude.

Laboratory examination of virus from such plants showed a high degree of bacterial contamination, the most common organisms found being *Staphylococcus pyogenes aureus, albus* and *citreus, Staphylococcus cereus albus* and *flavus, Staphylococcus epidermidis albus, Proteus vulgaris, Bacillus subtilis,* yeasts and molds, and not infrequently streptococci. Some of the organisms were found virulent for laboratory animals. Tetanus was never found, though always searched for most carefully. As high as 74,000 bacteria per vaccine tube were found in one lot examined.

The faults found in certain of the places showed the great need of some control of these products. I take pleasure in saying that when faults in construction and administration were discovered, the manufacturers showed a ready appreciation and willingness to remedy the same. Some establishments which at the first inspection were reported against, having remedied the faults found, have been reinspected and granted licenses.

Blanks to be filled out by the inspectors for barns and for each product are provided. I have a few copies of them which will be passed around.

Recently some valuable work has been done with other substances than glycerin to be used in the destruction of the bacteria found in vaccine. These substances are sodium biborate, boracic acid, carbolic acid, chloroform and potassium cyanide. Of these chloroform seems the most valuable. Allen B. Green in a report to the Local Government Board of England, says that by the use of chloroform vapor the crude pulp is freed from non-spore bearing germs in from a few hours to seven days, while the active agent of the vaccine remains potent as long as in the glycerin controls, and in six cases longer. The quick elimination of the extraneous bacteria by this method is a great saving in time as compared with the use of glycerin, which rarely exerts its full effect before the fourth week. Chloroform, being extremely volatile, can be allowed to evaporate from the vaccine under asceptic precautions after being allowed to act as long as desired. It would be especially useful in hot countries where the active agent in vaccine does not retain its potency long or when, as in epidemics, sudden calls are made for large quantities of virus.

Gaylord and Wheeler, in a recent article, have called attention to the use of a solution of potassium cyanide for the destruction of bacteria in vaccine. They state that a N-200 solution exerts a complete bactericidal action upon vaccine without affecting the potency of the virus and that while it is an active poison it is so volatile that in five or six days no trace can be found in solutions kept in test tubes simply plugged with cotton.

BIBLIOGRAPHY.

Gaylord, H. B.,and D. C. Wheeler: On the destruction of bacteria in vaccine pulp with potassium cyanide. Am. Med., 1903, p. 349.

Green, Allan B.: Use of chloroform and other substances for the destruction of bacteria in vaccine. Report of the Medical Officer of the Local Government Board of England, 1901-1902.

————: Preliminary note on the use of chloroform in the preparation of vaccine. The Lancet, 1903, p. 1738. Proc. Roy. Soc., London, 1903, p. 1-4.

Rosenau, M. J.: The bacteriological impurities of vaccine virus; an experimental study. Hygienic Laboratory, U. S. Public Health and Marine Hospital Service, Bulletin No. 12, March, 1903.

————: The antiseptic and germicidal properties of glycerine. Hygienic Laboratory, U. S. Public Health and Marine Hospital Service, Bulletin No. 16, September, 1903.

————: Dry points versus glycerinated virus from a bacteriological standpoint. Am. Med., April 19, 1902, p. 637.

IMMIGRATION AND THE PUBLIC HEALTH.

By Dr. A. J. McLAUGHLIN,

Assistant Surgeon Public Health and Marine Hospital Service, Washington, D. C.

The popular belief that immigration constitutes a menace to the public health is not without foundation. Newspapers and magazines contain graphic accounts of the squalor and insanitary conditions of the tenement districts of our great cities. Recent newspaper reports and comments upon the remarkable spread of trachoma in the public schools of New York and other great cities add to the popular feeling of distrust, and the opinion is gaining ground everywhere that more stringent means must be devised for keeping out the undesirable class of immigrants which augments the frightfully overcrowded population of the tenement district of New York and other large cities.

In the consideration of danger to the public health from immigration, three factors must be taken into account: first, the physique of the immigrant; second, his destination; and, third, the presence or absence of communicable disease.

The first mentioned, the physique of the immigrant, is by far the most important factor. Good physique was much more general among immigrants a quarter of a century ago than among the immigrants of today. The bulk of the immigrants previous to 1880 came from the sturdy races of northern and western Europe, and, not only was good physique the rule, but communicable, loathsome, or contagious disease was extremely rare. The immigration from Ireland, Germany, and the Scandinavian countries is insignificant today compared with the thousands of Slavs, Italians, Hebrews, and other immigrants from Southern or Eastern Europe, which now crowd American-bound vessels and pour through the ports of this country in an ever increasing stream.

With the change in the racial character of immigration, most marked in the past decade, a pronounced deterioration in the general physique of the immigrants, and a much higher percentage of loathsome and dangerous diseases is noticeable. Thousands of immigrants of poor physique are recorded as such by the medical inspectors at Ellis Island, and a card to this effect sent to the registry clerk or immigrant inspector with the immigrant, but this mere note of physical defect carries little significance under the present law,

and the vast majority of them are admitted by the immigration authorities because it does not appear that the physical defect noted will make the immigrant a public charge. When the physical defect or poor physique is so marked that it seems to the medical inspector likely to make the immigrant a public charge, the immigrant is detained, and a certificate is made stating his disability, which certificate goes to the board of special inquiry with the detained immigrant. About two-thirds of the immigrants so certified as likely to become a public charge are admitted because of the latitude allowed by the phrase, "likely to become a public charge." Under the present law, therefore, the immigrant certified as suffering from a loathsome or dangerous contagious disease, or as being idiotic or insane, is deported. The immigrant recorded as having a "poor physique" or other physical defect is usually admitted.

Destination is scarcely less important than physique, and it is the rule that aliens of a race having a low physical standard will invariably herd together in the overcrowded insanitary tenement districts of our great cities, while the sturdy races of unskilled laborers are scattered over a wide territory and tend to establish little homes of their own in the country or in the suburbs of manufacturing towns or cities.

The following table indicates the relative physical strength of the various races under discussion, and also the percentage of each race giving New York as their destination. Statistics of the Irish and Scandinavian races are given in this table for the purpose of comparison.

Race.	Ratio sent to hospital on arrival to total number landed.	Ratio deported on medical certificate to total number landed.	Percentage remaining in New York.
Hebrew	1 to 90	1 to 393	70%
Italian	1 to 177	1 to 535	50%
Slav	1 to 200	1 to 575	15%
Irish	1 to 715	1 to 1450	33%
Scandinavian	1 to 716	1 to 3280	18%

The third factor to be considered is the presence of communicable disease among immigrants. The ordinary quarantinable diseases are eliminated from the question by efficient quarantine methods, but certain communicable maladies, classed as loathsome or dangerous contagious diseases, exist among immigrants, and constant vigilance and considerable skill are necessary on the part of medical inspectors of

immigrants to detect these cases and separate them from the healthy immigrants.

The most important of these diseases, because of its frequency, is trachoma. Of the total number of cases of loathsome or dangerous contagious disease found in immigrants, 87 per cent. are due to trachoma and 10 per cent. to favus.

Several years ago the prevalence of trachoma in the poorer districts of our large cities, and particularly among the foreign born population caused numerous requests from medical men engaged in eye work in various parts of the United States that trachoma be placed in the list of excluded affections. This was done in 1897, with the result that a great many suffering with the disease were taken from among the steerage immigrants and deported. It was then discovered that ordinary steerage aliens suffering from trachoma were being transferred to the cabin, while en route, or after being refused passage in the steerage at the port of departure, would be sold a cabin passage, with the assurance that cabin passengers were not inspected at the port of arrival. To check this practice and to make the inspection of aliens complete, a cabin insepction was instituted in the fall of 1898. The cabin inspection has been very successful in preventing evasion of the law, but many steamship companies were still apparently careless of the diseased condition of immigrants to whom they sold tickets. By the last immigration law (1903), a penalty of $100.00 is imposed upon the steamship company for each diseased alien brought to our ports, provided the disease evidently existed at the time of the immigrant's taking passage and could have been detected by ordinary medical skill. This penalty has had a salutary effect in causing the steamship companies to institute a more rigid medical inspection at the European ports of departure. Formerly the presence of a diseased alien in the steerage was a matter of more or less indifference to the steamship companies, as they could carry him back to Europe, if deported, and still make a profit on the price of his original passage.

It is not possible within the limits of this paper to go deeply into any particular disease, but I can only briefly mention here two points about trachoma which have occasioned considerable discussion. These are its contagiousness and its likelihood of causing permanent injury to sight. The contagiousness of trachoma is recognized and conceded by those who have seen a sufficient number of cases of the disease to form an accurate impression. Striking examples of its contagious character can be seen any day on Ellis Island. The last annual conference of State and Provincial Boards of Health, held at New Haven,

October, 1902, placed trachoma in the category of diseases communicable and dangerous to the public health.

Permanent injury to sight is most likely to occur in cases where early treatment is neglected. Among immigrants with trachoma, ignorance of personal hygiene and inability to secure proper treatment make the spread of this disease alarming and the consequences to sight disastrous.

The area in Europe where trachoma is most prevalent extends from the Gulf of Finland on the north to the Black Sea and the Mediterranean on the south, and from Moscow and the Volga on the east to the Carpathian Mountains on the west. In addition, it is prevalent in Greece and Southern Italy, probably because of commercial intercourse with Syria, Egypt, and the Barbary States. The first mentioned area is occupied by Finns, Lithuanians, Russians, Poles, Russian-Germans, and Hebrews. The statement is made in some textbooks that trachoma is prevalent among the Irish. Observation of immigrants shows that this statement is not true. There is less trachoma among the Irish than in any other race of immigrants. The table given below indicates the ratio in which this disease was found among the immigrants landed in 1902.

Race.	Ratio of cases of trachoma to number imigrants landed.
Syrian	1 to 66
Armenian	1 to 192
Lithuanian	1 to 375
Finn	1 to 496
Hebrew	1 to 539
Greek	1 to 667
Slav	1 to 758
German	1 to 772
Scotch	1 to 1216
Magyar	1 to 1243
Italian	1 to 2066
Scandinavian	1 to 3486
English	1 to 3623
Irish	1 to 4173

Favus for several years has been included in the list of excluded diseases. If the disease had existed for any length of time, it is of course easily detected by the loss of hair, and changed character of the individual hairs and the scalp, but in cases of recent origin detection is often difficult because of shrewd efforts at concealment.

The immigrants are often prepared for inspection, the tell-tale yellow crusts carefully removed and the scalp cleansed.

Tubercle of the lungs is rarely found among immigrants on arrival. Thousands of immigrants are examined whose poor physique suggests to the medical examiner the possible existence of tuberculosis, but out of the many thousands thus examined at Ellis Island last year, only fifteen cases were certified as suffering from tubercle of lung. The same is true of venereal disease. In spite of the rigid examination of many thousand immigrants at Ellis Island, only five cases of syphilis, and a total of seven cases of venereal disease, were found in 1902.

This apparent freedom from certain diseases is partly explained by the fact that tubercular and venereal diseases are notoriously diseases of the cities, while the bulk of our immigration comes from the agricultural communities and small towns. The remarkable prevalence of tubercle among recently landed immigrants is the effect of horrible overcrowding in infected, filthy tenements by immigrants whose poor physique makes them ready prey for communicable disease. In addition to the horrible congestion of the tenements, the insufficient food and insufficient fuel and clothing, especially among immigrants from Mediterranean countries, must be considered as factors in the development of tuberculosis.

The danger to the public health from immigrants suffering from communicable disease is at present comparatively slight.

The United States Public Health and Marine Hospital Service is charged by law with the medical inspection of all incoming aliens at ports of the United States. Officers of the Service receive special training for their work as medical inspectors of immigrants. Ellis Island, New York, is used by the Service as a great school of instruction where young officers, before being detailed for immigration duty at one of the other ports of entry, are trained in the detection of the particular diseases and defects likely to be found in immigrants. Canada has always been a favorite route for undesirable immigrants wishing to evade the law, and officers of the Public Health and Marine Hospital Service are stationed for immigration duty at Quebec and other Canadian ports, and at various points upon the Canadian frontier. Certain steamship lines make a regular business of carrying to Canada for subsequent entry to the United States aliens who have been rejected and sent back from an American port, or who manifestly belong to the excluded classes, or who have been rejected by other steamship lines who have some regard for laws.

The officers of the Public Health and Marine Hospital Service stationed at Quebec, Halifax, N. S., and St. Johns, N. B, have authority

to examine only those aliens manifested as destined for the United States through Canada. Immigrants so manifested do not differ materially from immigrants ordinarily received at United States ports, and are given certificates of physical fitness which admit them to the United States through any of the border points. Thousands of immigrants evade this inspection at Quebec, Halifax, or St. Johns, by being falsely manifested as destined finally to Canada. They have no certificates of inspection by United States officers at Quebec, Halifax, or St. Johns, and upon attempting to cross the border are sent back to Montreal for examination.

In order to show the quality of the immigration brought by the Beaver Line and other lines engaged in this nefarious business, it is only necessary to state that 50 per cent. of the immigrants attempting to cross the border last year were rejected, whereas the usual percentage of rejection at United States ports is only one per cent.

A regularly organized system of smuggling diseased immigrants across the border has been exposed by the United States immigration authorities at Montreal, and although the border inspection maintained by the United States Immigration Service is doing splendid work, it is impossible to guard effectively every point of over 3,000 miles of frontier. A more perfect system of exclusion is now possible because of an effective Canadian law similar in character to our own which has recently been enacted.

The real danger to the public health from immigration lies in that class of immigrants whose physique is much below American standards, whose employment is in the sweat-shop, and whose residence is the East Side tenement in New York City. The Mediterranean races, Syrians, Greeks, and Southern Italians, who are unused to a cold climate, and who often have insufficient clothing, also establish in their crowded "quarters" splendid foci for the dissemination of disease. The Hebrews, Syrians, Greeks, and Southern Italians, invariably crowd the most insanitary quarters of the great centers of population. And the various filthy and infected, though perhaps picturesque, foreign "quarters" constitute today the greatest existing menace to the public health.

There are many viewpoints from which our immigrant problem may be judged. There are extremists who advocate complete exclusion of all immigrants, or the complete exclusion of certain races. There are other extremists who pose as humanitarians and philanthropists and who advocate an act of lunacy — removing all restrictions and admitting all the unfortunate — the lame, the halt, the blind, and the morally and physically diseased — without let or hindrance. Neither of these extreme positions is tenable. The debarring of all immigrants,

or the unjust discrimination against any particular race, is illogical, bigoted, and un-American. On the other hand the indiscriminate admission of a horde of diseased, defective, and destitute immigrants would be a crime against the body politic which could not be justified by false pretense of humanity or a mistaken spirit of philanthropy.

The sane, logical position must fall between these two extremes. It is necessary for us to restrict and debar, if possible, all undesirable immigrants. A jealous regard for the public weal may demand measures and standards which seem to the humanitarian and philanthropist selfish and inhuman; but charity begins at home, and it is the right of Americans to exclude the undesirable and to employ whatever measures, and set whatever standards seem necessary to exclude that class which menaces the social and physical welfare of the country.

If we debar any undesirable class of immigrants under the law, we should endeavor to make the law as nearly perfect as possible and debar all undesirable classes. We debar the immigrant with trachoma, syphilis, leprosy, or favus; also the insane, the epileptic, and the idiotic, but we admit the immigrant with poor physique, unless it is so marked as to make him undeniably a public charge.

There should be but one standard of physique for the immigrant, no matter whether his destination be the Pennsylvania mines or the New York sweat-shops. The skilled laborer should be expected to possess the same rugged physique as is now expected of the unskilled laborer. The standard should be fixed by law by comparison with other well recognized standards of physique, and should be sufficiently high to exclude all who could not beyond doubt make a living at hard manual labor. The wording of the law should be definite enough to make the medical certificate of poor physique equivalent to deportation.

This requirement of a definite physical standard in immigrants could be exacted without undue hardship of all unmarried male immigrants within certain age limits, for instance, 18 to 45. In regard to families comprising women, children, and old men, in addition to males between the ages of 18 and 45, each family should be required to have at least one member constituting its chief support who could comply with the physical requirements of the law. The law need not apply to parents coming here to join their children, provided the children had established a home here and presented evidence of ability to properly care for their parents.

If the thousands of recruits for the sweat-shop army which arrive each year could be thus checked for ten years, the present existing tenement house problem would solve itself. The terrible congestion

of the tenements would be relieved; the scale of wages for the sweat-shop worker would be elevated, and the general sanitary conditions of life in such districts as the Lower East Side, New York City, improved sufficiently to reduce the menace to the public health from this cause to a minimum.

FACTORS OPERATIVE IN THE SPREAD OF A CHOLERA EPIDEMIC AND THE MANAGEMENT OF THE SAME FROM A QUARANTINE STANDPOINT.

By Dr. J. C. PERRY,

Passed Assistant Surgeon, U. S. Washington, D. C., Public Health and Marine Hospital Service.

The pertinent facts contained herein relative to the means by which cholera is spread from one locality to another and through an infected town, were gleaned during active work in connection with the severe cholera epidemic in the Philippine Islands during 1902, which caused approximately 178,000 cases with 115,000 deaths in the islands during the twelve months following its introduction.

The subject can best be treated under two general divisions: First, the factors operative in spreading the epidemic; second, the quarantine measures to prevent the introduction of the disease and instituted to check the spread of the epidemic, also the eradication of the disease. The former is naturally subdivided into the agencies by which the disease is spread from one locality to another and in a town or province after the infection is introduced.

In the epidemic cited the maxim that "cholera follows the line of travel and does not travel faster than persons" was forcibly exemplified, and the disease was carried from one district to another by two agents, viz.:

INFECTED PERSONS AND INFECTED FOOD.

The agency of infected persons is the usual one and epidemics furnish numerous examples of this factor. The history of most towns and provinces shows that a person had arrived from an infected center, becoming ill soon after arrival and thereby establishing a center of infection either through the contacts or most often by the intestinal discharges infecting a well or stream that was used as a water supply.

The introduction of infection through the medium of infected food, although well established in numerous instances, is a much less frequent factor. Cholera was introduced into Manila by this agency — infected vegetables, and another excellent example was an infected town in the Laguna province. In the latter the infection was introduced by food that was purchased in Manila for use at a *fiesta*. This was smuggled in under a false declaration and was served at the *fiesta* (consisted of cakes, sweetmeats, etc). Eighty cases of cholera, the

first in this town, were distinctly traced to this source, the person who purchased the food being among the victims.

It will probably be noted that I have placed water in the third place. While infected water is the principal agent in the spread of the disease in infected towns, it is not so potent in spreading the disease from one district to another or from town to town, except in those instances where an infected stream has been the source of water supply for several towns more or less widely separated. The appearance of cholera in a town above will cause infection in the towns lower down using the stream as a water supply. Several instances of this nature were noted in the epidemic cited.

The water of a vessel taken on at a cholera infected port may also be the means of introducing cholera; but it is generally through the infected persons that the disease gains an entrance. Wearing apparel might introduce the disease by being soiled with the infected discharges, and a person by handling the same might infect his food. Cargo, in my opinion, is safe except rags, gunnies, etc., that have been recently gathered, and fresh vegetables,

SPREAD OF THE DISEASE IN TOWNS AFTER INFECTION.

The dissemination of the disease in towns after the infection is introduced occurs through (1) water, (2) foods, (3) contacts and (4) flies.

In the provinces and provincial towns of the countries in which cholera prevails in epidemic form, the disease is spread principally through the water supply, since in most places, especially in the country, the supply is obtained either from shallow surface wells or small streams; and as these become infected early through the habits of the natives in disposing of intestinal discharges, washing clothes and bathing in the streams, or washing their clothing near the wells so that part of the water drains back, the disease soon becomes epidemic, especially sharp and severe where the water supply is obtained from streams and of slower increase where the water is obtained from wells, because all wells would scarcely become infected at the same time.

Food is another means of spreading cholera. Fresh vegetables, such as lettuce, onions and other articles of a similar nature, eaten in an uncooked state, and cold cooked food that has become infected from contact with dirty hands or by sprinkling with infected water, are potent factors. Cooked food forms an excellent medium with rapid increase of the vibrios, so that in a few hours the food becomes capable of producing a fatal attack of cholera when ingested. Fruits do not seem to be an appreciable factor in spreading cholera, although when

taken in excessive amounts they may derange the digestive functions and produce diarrhea, thereby predisposing to the disease by furnishing a fruitful soil for the development of cholera if a few germs are taken into the stomach, since in healthy conditions a few vibrios ingested would probably perish.

CONTACTS.

In speaking of "contacts" as a means of spreading cholera, I wish to be distinctly understood in the first place that by this is not meant that a person has simply been in the same house or in actual close communication with the sick, because in such cases the danger is little greater than in typhoid fever; but reference is made to the persons who have soiled their hands or clothing with the intestinal discharges by such communication. It can readily be seen that among the ignorant this class is by no means uncommon, and they become a menace not only to themselves but to others through their ability to infect drinking water, vessels they touch and food after it has been prepared. The hands or clothing of this class often become infected in rendering assistance to a stricken comrade, member of the family or friend, and they become a source of danger as noted above.

Of course if one could apprehend and disinfect all persons that had been in contact with the case the problem would be solved; but unfortunately it is impossible to do this because the other occupants of the house have generally managed to escape before the case is detected or reported as suspicious.

While this factor is not the principal source of spreading the disease and it is true that infection in the vast majority of instances is disseminated through the routes of water and food, still the minor ones must be borne in mind, and so many examples of this class or of the class of contacts here specified have come under my observation that this article would be still further incomplete if no mention was made of this factor.

During the study of cholera in sixty vessels on which the disease occurred while in quarantine, clear examples of secondary cases among the contacts (personnel of the ship) occurred in the majority of instances. Inquiry gave the history of the second victim having assisted the first and, soiling his hands, had infected his food before it became possible to disinfect.

In one case an officer of the ship even went so far in his precautionary measures as to immediately change his clothing, take a bath and attempt disinfection of the hands after rendering assistance to a stricken brother officer; but he died from cholera three days later.

These secondary cases nearly always occurred after the period of five days after embarkation; and since the food and water supply was the same for the entire personnel, the infection could not have been acquired from this source, because if the latter was true many cases would have occurred instead of one or two.

FLIES.

The remaining factor mentioned under headings at the commencement of the consideration of the methods by which infection is spread in infected towns, that of flies is the least serious; in fact, I do not believe that these insects are conveyors of the infective microbes, except in certain isolated instances. Of course this source of danger must be borne in mind, but does not assume an important place in the spread of an epidemic. However, some of the cases that occur in an epidemic are difficult of explanation, unless the theory that flies convey the poison is accepted. A good example of this agency is shown in the history of the cases that occurred in the prison at Manila during the epidemic cited.

The facts briefly reviewed are as follows: From the appearance of cholera in Manila nothing except sterilized water was used or allowed the prisoners to drink, and later the hydrant water was discontinued for baths because it was thought that some of the inmates drank it, and the use of this water might account for some of the cases of cholera that had occurred.

Food was regularly inspected both before and after cooking and anything that might be the least suspicious was not allowed. All persons who visited prisoners were not permitted to bring in anything, and they were searched to see that no food or drink was smuggled into the prison for the use of their friends. The food and water was the same for all inmates, but was served in different places, prisoners (trusties) attending to the cooking and serving, so that the prison was practically shut off from the outside world.

However, in spite of the precautions a case of cholera occurred in the prison two weeks after the appearance of the disease in the city. The case recovered and none occurred until fourteen days later (April 17), when a second case developed in an entirely different group of prisoners. After this no more cases occurred until May 3d. One case developed on May 3, 5 and 8 in entirely separate buildings and among prisoners between whom there was no communication. No cases occurred in June, but in July there were five isolated cases occurring in different sections and independent of each other. In all there occurred

thirty cases in the prison during the epidemic. Now, how can the infection in these cases be explained?

If the food and water had been infected, the number of cases would have been greater and there would not have been isolated cases at long intervals. The smuggling in of food by visitors for the use of their friends seems to have been amply guarded against; but even admitting that the latter happened in spite of the rigid precautions, it would not explain the occurrence of three cases among prisoners serving a life sentence because they were allowed little liberty and did not see visitors.

The cases cited is not the history of infected water or that of general infected food supply and we must look for specific infection, tnat is, the infection of food after it had been cooked and served to the individual person. Nothing else will conform to the history of these cases. However, flies will meet many of the indications mentioned, and in my opinion they must be held responsible for conveying the infection in certain specific cases such as cited above. These insects were present in the prison and the source from which they could convey the infection was at hand, for immediately surrounding the prison more than 200 cases had occurred in a short time, and the daily number of new cases furnished the material for the flies to carry the infection on their feet and bodies to the individual plate of food consumed by the unfortunate.

QUARANTINE MANAGEMENT.

The object of all public health regulations is the prevention of disease and this renders of paramount importance the quarantine procedures instituted to prevent the introduction of a disease from a distant center of infection to another country or port. The importance of such procedures relative to all quarantinable diseases cannot be overestimated, and even, if possible, becomes of more paramount importance when applied to the prevention of the dissemination of cholera, as this disease rapidly spreads, unless promptly checked, until it assumes epidemic proportions with the resultant severe loss in both lives and money. The enforcement of quarantine at foreign ports — ports of departure — is one of the most important functions that fall to the lot of officers of the Public Health and Marine Hospital Service; since if the disease is prevented by such quarantine regulations from infecting the ship or her personnel, the battle is won and the port of arrival is not threatened.

The most important function is that of eliminating from the personnel of the ship those that are liable to convey infection, and for

this purpose the persons that a vessel carries can be divided into two classes (1), steerage passengers and crew, and (2) cabin passengers. Therefore, passengers from a place in which cholera is prevailing form the most important factor, and none should be allowed to embark unless five days have elapsed since the possibility of their having contracted the infection. Steerage passengers from cholera infected ports or those exposed to infection en route should be detained five days after disinfection of their personal effects and possible exposure to infection before they are allowed to embark. Their food and drink during this period must necessarily be above suspicion. The crew, if they have gone ashore in a cholera-infected center, must be subjected to the same treatment, but they are generally kept aboard the vessel while in port. If this rule is properly enforced this factor is eliminated.

Cabin passengers may be allowed to proceed without detention, because they come from the more intelligent classes and eschew articles of food and drink that are suspicious. Their baggage is safe without disinfection.

Another matter of importance that must be regulated is that of water and food for use on the ship. They must be from a source free from infection and uncooked articles, such as lettuce, radishes, etc., should not be allowed. Drinking water should be boiled if the source is not above suspicion.

In this connection it may be well to state that all food which steerage passengers bring with them should be removed and destroyed before they commence to serve their period of detention.

Attention should also be paid to the cargo of the vessel, and old rags recently gathered, old gunnies, fresh vegetables and certain animal products that come from a place infected with cholera should be prohibited. New and clean merchandise is safe. Attention should also be directed to ballast, especially if water is used, and the latter prohibited if taken from a suspicious source.

The quarantine management when the disease gains an entrance should be drastic and vigorous, especially in the incipiency of the epidemic, no matter whom it affects. The fewer concessions made the less rapid the spread of the disease, the shorter duration of the epidemic and the greater the saving not only in human lives but also in financial losses. The time to fight a fire is while it is still smouldering and not when the conflagration is raging; the same is true of a cholera epidemic.

To state briefly: Look after the water supply, supervise the food, destroying that which is considered dangerous and impose rigid and indiscriminating quarantine so that persons from the infected center cannot enter a clean locality until five days have elapsed from exposure to

possibility of infection. The most satisfactory manner in which to accomplish this is to detain persons at port or place of entry in a suitable camp or quarantine station for the requisite number of days.

SUMMARY.

1. Infected persons is the most potent factor in spreading a cholera epidemic, or in introducing the disease from one place to another.

2. Other factors operative in spreading an epidemic from one locality to another are — food and water.

3. Factors operative in spreading the disease after cholera has gained an entrance are as follows enumerated in the order of their frequency: (1) Water, (2) food, (3) contacts, (4) flies.

4. Protective quarantine regulations should be enforced at the port of departure in order to protect the port to which the vessel goes. This should embrace disinfection and detention of steerage passengers and the crew of vessels, supervision of food and water supply, and the rejection as cargo of such articles as are liable to convey infection, especially fresh vegetables grown and packed in infected centers.

5. After the introduction of the disease a rigid quarantine should be imposed in order to prevent the infection spreading to adjacent towns, and the water and food supply should be carefully examined, prohibited or destroyed when of a suspicious nature.

A NATIONAL INSTITUTE OF HYGIENE.

By Dr. FRED J. MAYER, Scott, La.

Bowditch, in his address on "Hygiene and Preventive Medicine" before the International Medical Congress in Philadelphia in 1876, said: "Our present duty is organization; national, state, municipal and village, from the highest place in the national council, down to the smallest village board of health, we need organization, with these organizations, we can study, and often prevent disease." With this inspiration, an attempt was made in Louisiana in 1885 to interest the general public in sanitary matters by illustrated lectures, that fell through, for want of means to conduct them. The epidemics of yellow fever in 1897-8-9, with the enormous loss to commerce, incident thereto, as a result of shotgun quarantines, led to the formation of the "Louisiana State Sanitary Association," the objects and purposes of which are set forth in the following excerpts from its charter: —

"The purposes and objects of such corporation as set forth in article II of its constitution, adopted November 22, 1897, are declared to be:

"The advancement of sanitary science,

"1st. By the organization of a central sanitary body with auxiliary circles in every parish in the State and its extension, until it embraces all the Southern, and particularly the Gulf and South Atlantic States.

2d. The founding of a school of hygiene and quarantine on the Chautauquan plan of correspondence, lectures and summer institutes.

3d. The publication of a monthly journal devoted to the objects of the Association.

4th. To secure through an educated public opinion the enactment of adequate health laws: Laws on vital statistics, on food adulteration and water pollution, on meat and dairy inspection, on vaccination, and their enforcement; and the founding of hospitals for contagious diseases.

5th. To systematically educate the people of the State to the necessity of substituting rational, scientific, uniform, maritime and inland quarantines during periods of epidemic danger or invasion for the barbarous shotgun quarantines, which while crippling commerce afford at best a doubtful and insecure protection.

6th. The restriction and prevention of tuberculosis and the founding of sanatoriums for its hygienic-dietetic treatment."

That its officers and committeemen shall be such as are chosen at an annual convention of the "Louisiana State Sanitary Association,"

to be held at the times and places declared by it, and that such officers and committeemen shall consist of a president, vice-presidents, one from each congressional district, now or hereafter to be formed, a secretary and treasurer, and the following standing committees:

1. The Executive Committee.
2. The Finance Committee.
3. The Advisory Council.
4. The Publication Committee, and the Board of Regents of the School of Hygiene.

That its Executive Committee shall consist of the officers, the ex-Presidents, the Regents, the Lecturers in the School of Hygiene, and Finance Committee.

That its Advisory Council "Shall consist of delegates from each Sanitary Circle in the State, from each Town Council and Police Jury of the State, from the Commercial Exchanges and Boards of Trade, from the Boards of Health, from the Medical, Pharmaceutical and Dental Societies, from the Colleges, from the Louisiana Chautauqua and other educational and scientific bodies, from the Press Association of the State, and the Press Club of New Orleans, and the Commercial Travelers' Association; the basis of representation from each to be fixed by the Executive Committee."

Under the auspices of this body, two Institutes of Hygiene were held, one in an interior town, and the other at the State capital; both were eminently successful and demonstrated the feasibility of the plan; the only trouble was the cost of holding them fell on the shoulders of a few, the business men, and transportation companies failing to take any interest therein, although both, and particularly the latter, would have been the chief beneficiaries of a system, whose avowed purpose was to inhibit the disastrous estoppel to commerce by educating the masses in the inutility, and unwisdom of an unscientific shotgun quarantine, which at best afforded a doubtful and insecure protection.

When the Institutes fell through, an attempt was made to secure the passage of a law known as H. B. No. 63, by ex-speaker Henry (General Assembly of 1900), to create a Commissioner of Hygiene, whose function would have been purely educational. It passed both branches, but was vetoed by the governor in the following words: "The demand upon the treasury of the State, for the ensuing two years, has been unusually great and in the proper endeavors to hold the public expenditures within the revenues, numerous meritorious requests have been regretfully refused. This situation clearly suggests the avoidance at this time to assume new obligations, which could be deferred, however useful or meritorious such obligations might appear to be." The reasons assigned did not exist in 1902, when the

Bill was introduced by Hon. W. W. Ventress, and although it passed the Senate unanimously, and the lower house by an increased vote, it was again vetoed in despite of the fact that it had been twice endorsed by the Louisiana State Medical Society, the Louisiana State Agricultural Society, the State Pharmaceutical Society, the Mobile Quarantine Convention and other scientific bodies. It is of interest to note in this connection that another Bill to create a Commissioner of Labor, to which the governor was also antagonistic, *did not receive his veto;* it goes to illustrate what a rocky road the sanitarian has to travel to secure the legislation necessary to make effective his labors for the public good.

Over a quarter of a century has elapsed since Bowditch sounded his note of warning, and yet as late as September, 1893, at the International Medical Congress, Dr. Pepper in his presidential address closed by saying: —

"Nor can this work be accomplished until Bowditch's cry for organization is more fully answered than it yet has been. Nothing but organization and coöperation, and yet more the establishment in the government of every civilized nation of a Department of Public Health, will secure the continuous and forcible attention which the magnitude of this enterprise demands. There should be, and the day cannot be far distant, when there shall be in the cabinet of every government here represented a Secretary of Public Health of rank and influence and prerogative equal to that of any other cabinet officer."

It is a significant fact that there is not on this continent a popular School of Hygiene, and preventive medicine, that in the regular medical colleges Hygiene is usually given a subordinate position, as an adjunct to other chairs; although in the language of Spencer: "A knowledge of the laws of life is more important than any other knowledge whatever,"-and that a "Knowledge which subserves direct self-preservation by preventing loss of health is of primary importance."

Quoting from the annual oration delivered before the Orleans Parish Medical Society, January, 1898: —

"The distinctive and original feature of the plan (proposed), and the one which will more quickly reach the desired end: the sanitary education of the masses, is the School of Hygiene and Quarantine, on the Chautauquan plan, of correspondence, lectures and summer institutes.

"This Institute of Hygiene and Quarantine will be organized by the selection by the Board of Regents of a faculty to fill the following chairs: —

1. Hygiene.
2. Quarantine, Maritime, and Inland.

3. Miasmatic Contagious Diseases.
4. Acute Contagious Diseases.
5. Pathology of Miasmatic, Contagious and Malarial Diseases.
6. Bacteriology.
7. Serum Therapy.
8. Physiology.
9. Malarial Diseases.
10. Contagious and Infectious Diseases of Children.
11. Hygiene of Surgery.
12. Hygiene of Eye, Ear, Nose and Throat.
13. Hygiene of Skin, and Leprosy.
14. Hygiene of the Mouth.
15. Sexual Hygiene.
16. Dietetics.
17. Influence of Alcohol and Narcotics on Public Health.
18. Medical Jurisprudence.
19. Toxicology.
20. School Hygiene.
21. Agriculture in its Relation to Hygiene.
22. Manufacturers in their Relation to Hygiene.
23. Contagious and Infectious Diseases of Animals.
24. Sanitary Engineering.
25. Sanitary Transportation, and Disposition of the Dead.
26. Hygiene of Insane Asylums.
27. Meteorology, and Climatology.
28. Municipal Sanitation.
29. Car Sanitation.
30. Construction and Management of Detention and Observation Camps during Epidemics.
31. Tuberculosis, Restriction and Prevention.
32. Tuberculosis, Hygienic and Dietetic Treatment.

Immediately after their appointment, the chancellor will call a meeting, at which the lecturers will submit their programs, etc., decide on time and place of holding the Institutes of Hygiene. Any member of the Association in good standing, can matriculate and receive an education in the science of hygiene, etc.; and at the end of three years, upon passing a satisfactory written examination, may receive a certificate."

Graduates are urged to take a post-graduate course and to submit to examination at the end of every term, for which a seal will be added to their certificates, each seal after the first, representing a year of study successfully prosecuted, and representing so many milestones on the road to sanitary knowledge."

By the addition of chairs of biology and entymology to the curriculum, this idea could be elaborated in the establishment of a National Institute of Hygiene, embracing some of the features of the Sanitary Institute of Great Britain, but especially carrying out the idea herein outlined of carrying this sanitary instruction to the people, in their homes and by their firesides, through coöperation between the National Institute when established, and the states, through their agricultural, pedagogical and sanitary institutes. And to this end I ask this Association to pass the resolution referred to the Executive Committee at the New Orleans meeting, or the following: The American Public Health Association endorses the principle of public education in the fundamental principles of hygiene, and the true nature, cause and prevention of contagious and infectious diseases in man and the lower animals, and recommends the establishment of a National Institute of Hygiene, which would coöperate with the various states in popularizing such instruction; and that a committee be appointed to carry out the intent of the resolution and formulate a plan, and to report the same at the next annual session of the American Public Health Association.

MEASURES FOR RESTRAINING THE PROPAGATION OF VENERO-SYPHILITIC DISEASES.

By Dr. ULISES VALDES, Mexico, Mexico.

One of the greatest plagues that undermines society and causes innumerable victims besides bringing about the unhappiness of a great number of persons, is to be found in the venero-syphilitic diseases that afflict mankind. There can be no doubt that any labor undertaken with the object of restraining the propagation of this terrible evil would be of immense benefit to mankind.

Seeing that prostitution is the principal focus from which these diseases are spread, we must fix our special attention on that point and study the means that ought to be adopted in practice, in order to counteract its injurious influence.

These means can be divided into two classes, of which the first is legislative and the second hygienic. The former, which I confine myself to merely indicating, are all those that, like education, the increase of wages, the anti-alcoholic campaign, tend to improve the intellectual and moral level of the people and diminish the misery of the poorer classes of society, from which issue all that group of women, who rather than repulsion, inspire pity, and who try by the hire of their bodies to obtain food for themselves, for their sick mother or for a small child, which otherwise they would with difficulty obtain.

The second method that I propose, and the only one which in a way comes under the influence of this Association, covers all those measures that are taken, not to prevent prostitution, but to avoid its carrying the contagion. The principal measures are similar to those general ones that are recommended to restrain the propagation of any other transmissible disease, amongst which the most important is the isolation of the patient, and the publication of the personal precautions that ought to be taken by the persons who come into contact with the patients or run any risk of so doing.

The efficacy of the isolation of a patient who might carry his disease to healthy persons, is no longer a matter of doubt. We in Mexico every day see the isolation of persons suffering from typhus, leprosy, etc., and we have very lately observed the magnificent results obtained in the campaign against the bubonic plague, which Doctor Liceaga so ably directed, and yet notwithstanding these evident proofs, we still see that this "trade in poisonous goods" is freely permitted whilst in other diseases, the strictest quarantine is imposed, careful

disinfections are made of persons and baggage and in one word, by means of isolation, attendence on and disinfection of the patient, we erect a barrier against the transmission of the germ. Why cannot we apply the same method of procedure against a disease, that if not so rapid in its progress is no less certain in its results? Why cannot we decree the isolation of diseased prostitutes, who by their trade so extensively propagate the evil?

The principal difficulties in carrying this measure into practice, lie in the enactment and in the prudent application of the necessary regulations.

The defenders of the free exercise of prostitution, plead in its favour, that statistics prove that the number of diseased women is greater amongst those who are subject to regulations than among those who are not, or who evade its fulfillment. These statistics prove nothing because they start from a false basis, and in order to destroy their value we need only draw attention to their principal defects. The women who are subject to regulations or who are licensed appear in those statistics whilst those whose names are not taken or who are left at liberty, mostly escape when they get sick; hence the proportion shown by the statistics refer to the total number of the former class, but only to a fraction of the latter, and consequently the proportions are false, and the deductions therefrom are also necessarily false.

It is also said that in those towns in which public women are attended in the hospitals when sick, no improvement has been observed in the public health. To destroy this argument, we need only give a glance at any of the hospitals in which these women are received, for example, our own Morelos Hospital, and see there about 400 women suffering from venereal and syphilitic diseases, of whom the majority would find no difficulty in continuing their trade, and thus constituting themselves, each and everyone, foci of disease. Can it be denied that the public health would gain immensely by the elimination from their trade, of this large number of diseased women? Unquestionably it would.

Others plead the immorality of the law which would regulate prostitution, because, according to these persons, the government which enacts such regulations converts itself into a protector and tutor of prostitution. But it may equally well be said that the government does not by this degrade itself, but on the contrary exercises the noble and elevated mission of a protector of society.

And lastly, as a strong argument they ask; why should the law be so strict only with the prostitutes and leave at entire liberty and outside of its action, the man who when he gets sick, is allowed to carry the contagion to other persons? The reason of this is very

plain: the law respects the man as it respects the modest woman because they do not trade with their bodies.

Having demonstrated, even though briefly, the efficacy of the isolation of diseased prostitutes and the necessity of this being enforced by regulations on the matter, I will not detain you to study the provisions that ought to exist in a good set of regulations, because that would make this paper too long, and also because they ought to be made the subject of a special study, and I will therefore proceed to mention some of the individual precautions that ought to be taken in order to prevent infection.

[The paper then gives in detail recommendations against infection and concludes as follows:]

The efficacy of these measures is well known to us, but they lose all their efficacy from the point of view of public health, if they are not communicated to the interested parties. The most efficacious method for doing so, would be to oblige the proprietors of assignation houses to instruct their clients in the above means of safety, to print in the licenses that are issued to prostitutes, the recommendations relating to the hygiene of the woman, and to fix in prominent places inside of the brothels, such instructions printed in large letters, relating to the precautions that ought to be taken by the visitors.

In concluding this brief paper, I will state:

1. That the regulation of prostitution is the basis on which measures taken to detain the propagation of venero-syphilitic diseases should rest.

2. That diseased prostitutes ought to be isolated during sickness in special hospitals, it being also desirable that such hospitals should present some means of reformation, such as work, instruction, etc.

3. That prostitutes should be instructed in the means which they must take to avoid infection in their own persons or in those of their clients.

4. That the visitors to brothels should be informed of the means which they ought to employ for the same purpose.

THE FLOORS OF THE HOSPITAL WARDS, CONSIDERED FROM THE STANDPOINT OF ASEPSIS AND ANTISEPSIS.

By Dr. M. MARQUEZ, Chihuahua, Mexico.

I.

The dust produced either by the wind or by cleaning and sweeping the streets, squares and rooms, contains, among other things a good many pathogenic germs of different kinds, which when inhaled, arrive to the mucous membrane, where they find favorable conditions for development and may produce dangerous infections which are more serious according to the malignancy of the agent conveyed by the respirable air. Microscopic fragments of minerals which may incrust the pulmonary parechyma, causing erosions, may form ways of entry into the organism of the terrible bacillus of Koch. Many germs are to be found floating in the atmosphere, as has been shown through the studies of Miquel, who observed in the air collected on the Atlantic Ocean beyond 100 kilometres from the shore 0.6 microbes per cubic centimeter; in less than 100 kilometres 2 microbes; on the summit of the mountains 2 to 3; on the vertex of the Pantheon 200; at Rivoli Street 3,400; in the new houses in Paris 4,500; in the old houses 30,000, and, as he was approaching the populated central parts, the amount of dust floating in the air increased in considerable proportions. In London he found 150,000 particles of dust and in Paris 200,000, while in the atmosphere of a small place there were no more than 200.

But if the air in the streets and private abodes is prolific in microorganisms, the air in the hospital wards reaches its maximum, as there will be added those coming from the pulmonary and cutaneous exhalations, from the excrementitious emanations, and other pathogenic productions, according to the sickness suffered by the patients.

Besides those deposited on the floor may reach great proportions, as can be seen through the experiments made by Dr. Simonini, to investigate the richness of bacteria to be found in the dust covering the floor of a ward in the Military Hospital of Desgenettes, at Lyon, which contained 16 beds used for a few months by a great number of patients who suffered pulmonary diseases, the greater part of grippe origin and four of typhoid fever. He found five classes of pathogenic bacteria well determined: the *Staphyloccus-pyogenus albus* and *aureus* of Rosenback the bacillus cóli-communis of Escherich, the *Bacillus pyocyaneus* of Gessard and pneumo bacillus of Friedlander.

On the other side, it is well known, the tendency of the dust to sediment itself, to deposit on the floor, walls, etc, and furniture of the patients in such a way that the minimum of germs in the air is always found at midnight, not only because during this time the windows and doors are closed and the atmosphere is not moved, but because the patients, nurses, etc., are at rest and thus cause no movement of the air and on this account, the dust falls down by its own weight over the surface as a precipitate on the bottom and walls of the reagent glass. Thus experiments have been made in the same ward during day and night and the comparison is as follows:

	Day.	Night.
Bacteria	23,033	200
Mouldy mossy	1,066	40
	24,909	240

The natural deposit of dust can be aided by artificial means, as by spraying the air with simple water or a liquid antiseptic as was shown practically by spraying a small ward of a capacity of 90 metres, having obtained a result, after making the proper analysis as follows:

	Before Spraying.	After Spraying.
Bacteria	11,750	4,385
Mouldy mossy	1,268	2,608

As can be seen the number of mouldy mossy increased considerably one or two hours after the spraying, doubtless by the effect of dampness favoring their germination. In another analysis, similar to this, Dr. Maregne observed before spraying 13,400 bacteria and 3,800 mouldy moss and afterwards, on the following day did not find any; but the ward had been kept closed after spraying.

II.

The above justifies the constant and energetic war which has been made for some time by the hygienists, prescribing that the pavements of streets, squares, etc., shall be made with water proof material, susceptible of being washed, such as asphaltum; the sprinkling of roads and causeways with sprays of petroleum; the prohibition of spitting on the pavement; of cleaning carpets on the public road; the cleaning of rooms by wet methods; and finally, speaking of the cleaning, asepsis and antisepsis of the hospital wards, it must be prohibited, the old way of sweeping, as it causes the elevation of the dust producing infections, which in some of the patients were light, and in

others persisted. This was noted always on the next day after the ward was cleaned.

Thus, the first condition which will permit the complete asepsis for the wards of our hospitals, shall be the adoption of absolute water proof floors and to stop dry sweeping as it was used in former times, with its fatal consequences. Even the wet sweeping, which is done in an imperfect manner on wooden floors, not water proof, allow in its junctures and crevices, thousands of pathogenic germs to gather, notwithstanding its covering with varnish, waxing or any other cover.

In consequence, only the pavement of roman cement (Portland) gives sufficient security of impermeability, facilitating its daily washing and the most perfect asepsis and antisepsis. It should be constructed as follows: First — that it should rest on a solid underground, very firm to avoid, in the course of time, settling crevices or cracks; second — that when it is put up, it must be done with sufficient workingmen, so that the whole work shall be finished in one day and in a whole body, without junctures nor any show of them on its union with the walls, said union to be curvilinear, and third — that according to the size of the floor, there shall be placed one, two or three sinks in the center connected with a drain in order to carry the water used in washing to the outside parts of the wards.

A floor with the conditions stated will be the most hygienic and will also furnish for the patients the most comfortable and complete asepsis. This is shown in the wards of the hospital Porfirio Diaz at Chihuahua, Mexico, where in the early part of the morning the pavements are washed a "grand eau"; afterwards the doors, tables, bedsteads, etc., are cleaned with cloths dampened in corrosive sublimate one to one thousand.

The observation and experience during the period of six years, in which we have been director of said hospital, shows the pavement of Portland roman cement to be the most hygienic for hospital wards, from the standpoint of asepsis and antisepsis.

HYGIENE OF THE EYES IN THE MEXICAN SCHOOLS.

By Dr. M. URIBE TRONCOSO, Mexico, Mexico.

Since the year 1890 when Dr. Ramos made the first statistics of the errors of refraction in the school children of Mexico[1] and to which I contributed with reports of about 1,000 cases, no systematic examination has been made with a practical object in view.

The statistical data which were then collected, clearly demonstrated the necessity of adopting hygienic measures to arrest the progress of the ametropia, that although not of such an alarming character as in Europe as regards the myopia, is sufficiently frequent to justify the intervention of the school authorities for the prevention of diseases of the eyes, which are caused by the continuous work in the schools.

In different articles[2] I have insisted, since that period, not only on the necessity of modifying the hygienic conditions of the school buildings, but also on the greater advantage of making a systematic examination of the eyes and ears of the children in order to give them the necessary optical correction and thus prevent the progress of ametropia, and at the same time increase the proportion of children who can apply themselves to their studies, by placing them in a more favorable condition to take advantage of the instruction which they receive.

In order to practically demonstrate to the teachers, the facility with which they can examine the eyes, and the great advantages which not only the children, but the teachers themselves would derive from that practice, I recently undertook the task of inspecting the eyes of all the pupils in the Normal School for professors of the city of Mexico, in which about 500 pupils are receiving their education, ranging over all the ages. After giving a few lectures on the anatomy and physiology of the organs of vision to the Normal pupils who are about to graduate as professors and who will in future have ample opportunities to apply their knowledge, I gave them some practical demonstrations of the proper methods to be employed in such examinations. The proportion of pupils who were found suffering from ametropia in this school, is in itself sufficiently great to demonstrate the necessity of adopting measures for diminishing the evil influence of the school in the health of the eyes. I hope that on this occasion, my investiga-

[1] The defects of refraction in Mexico, as compared with those of Europe. International Congress of Berlin, 1890.

[2] Hygiene of the eyes in the schools and optical correction. Annals of Opthalmology.

tions will bring about a practical result, and by informing the parents of the conditions of their children's eyes, will induce them to adopt the necessary steps to enable them to continue their studies with advantage. The total number of pupils examined amounted to 449, of which 402 were between 7 and 18 years of age, and 47 of the Normal pupils were between 13 and 29 years of age. The methods adopted were as follows: the determination of the acuteness of vision at a distance of 5 metres, by means of the test-letters; the determination of the near point and the examination by skiascopy of those suffering from ametropia, when their sight did not reach the normal condition.

In doubtful cases or where profound lesions were suspected I recur to opthalmoscopic examination, but never employed mydriatics. Although we carefully determined the near point, its indications were not taken into account for the hypermetropia, except in the older pupils, because it is known that this proof is subject to greater probabilities of error than that of the remote point, and dealing with children of minor age, its determination is not of any great practical result, as the correction of the hypermetropia in them is not generally accepted.

Of the 449 pupils who were examined, 260 or about 57.70% were normal, and 119, or 42.30% suffered from defective sight, the cases being divided as follows:

Hypermetropia or hyperopic astigmatism.....	24.93%
Myopia or myopic astigmatism.....	12.24%

In detail, these can be subdivided as follows:

Pure hypermetropia	11.35%
Pure myopia	6.01%
Hypermetropic astigmatism	13.58%
Myopic astigmatism	6.23%
Mixed astigmatism	0.89%
Irregular astigmatism	0.44%

It is necessary to bear in mind that the number of cases of hypermetropia only refers to the manifest and not the total hyperopia, which is certainly much greater; but from a practical point of view it is sufficient for an examination to reveal the presence of the former. In fact, Dr. Randall, after having, by the aid of the opthalmoscope discovered 75% of cases of hypermetropia, only found 26% by subjective examination.

On making a comparative study of the data collected by ages, we find that pure hypermetropia diminishes in proportion to age, for which reason we only found one case among the Normal pupils; but on the other hand, the hyperopic astigmatism is much more frequent amongst them and the number of cases of myopia mounts up to 19%.

At all ages there is a very considerable proportion of hyperopic astigmatism and this fact tends to confirm the ideas of Javal and Risley, who consider astigmatism the principal factor in myopia, the intermediate stage between the emmetropic eye when the pupil enters the school and the myopic eye when he leaves it, after long hours of close work and of continued effort.

The attention of European hygienists had been specially directed at first to the study of myopia, which, especially in Germany, has acquired enormous proportions, amounting to 50% of the students; but after studying the evolution of the eye and its transformations, great importance is now given to astigmatism which requires to be corrected as soon as possible by means of appropriate glasses, as it is more active than pure myopia and the approximation which it requires is more constant.

In Mexico the proportion of myopic cases has not been very considerable; the influence of race is notorious; in place of the widely separated orbits of the broad-faced German who requires to make greater muscular efforts in order to obtain convergence, with the result that the globe is compressed by the belt of exterior muscles and that the optic nerve is strained, the conformation of the cranium of the Mexican native gives a very short distance between the two orbits. The greater luminous intensity of the high table-lands, also facilitates the work, and the fact that even in winter there is no necessity of using artificial light in the class rooms, greatly diminishes the danger of a prolonged and close work. But if the cases of myopia do not reach a very high figure, on the other hand the proportion of cases of ametropia is certainly very considerable. Forty-two per cent. of the boys in the Normal school, have not a sufficiently clear sight to enable them to follow the teacher's explanations on the black-board, and 25% require so close an approximation that it is incompatible with the functional integrity of the organ.

Accomodative asthenopia is also a constant source of trouble to the pupil who weary of the constant efforts that he has to make in order to read, abandons the work and really becomes dull and idle. It is therefore very necessary, both from a hygienic as well as an educational point of view, to place pupils who suffer from ametropia in a position to struggle against the dangers that necessarily threatens their sight through their school life, which in Mexico is becoming daily more active, thanks to the continual increase in the number of schools.

It was at first believed that the remedy would be found in a modification of the hygienic conditions of the school buildings, of the furniture, books, writing, etc., and from that date commenced the great

hygienic revolution that has transformed those buildings into school palaces with all the proper conditions of light, ventilation, etc., in place of the former small and dark school rooms, situated in narrow and noisome streets. Hygienists pointed out the best conditions of light, of approximation during the work, the height of the benches according to the age of the pupil, that are required; the publishers reformed their books and printed them in larger type and on better paper, and certain schools were prohibited the use of sloping written characters, that require such a close application of the eyes in defective positions, and have substituted for it an upright style of writing. It was expected at first that all these improvements would for themselves give a complete result but after the lapse of several years, and with surprise it was found that they were not sufficient to detain the progress of myopia, which remained stationary. It has been so affirmed within a recent period by Cohn himself, after making very careful statistics.

The remedy consists in procuring for the pupils, besides all the hygienic conditions above mentioned, a complete optical correction of the defects of refraction, by making systematic examinations every year on opening the courses, separating those who suffer from ametropia and pointing out to the parents the necessity of putting them under the care of an oculist.

I would here mention the great impulse that many distinguished oculists of this country have given to the progress of ocular hygiene. The labors of Randall, Risley, Allport and others have greatly advanced this subject, not only by means of their carefully prepared statistics that have fully demonstrated the risks of scholastic life to the eyes, but have also practically facilitated the examinations, and shown that the masters themselves can assume this task, which presents no great difficulties.

By means of carefully prepared statistics of nearly 200,000 eyes which he has examined both in his own practice as well as through other opthalmologists, Dr. Risley[3] has shown that the correction by means of adequate glasses has brought about a decrease of myopia in Philadelphia from 28.43% in 1874 to 1880, down to 16.98% in 1890 to 1893.

It therefore appears to be generally agreed, that it is necessary to examine all children and correct their defects of refraction in order to prevent the development of myopia, and the American Medical Association, the national association of the United States, in its last meeting in New Orleans, on motion of Dr. F. Allport, adopted a resolution recommending to the boards of education, boards of health and legislatures of the different States of the Union, that the eyes and

[3] School Hygiene. Norris and Oliver. System of disease of the eye. Volume II.

ears of the school children of this country should be tested, both on their entering the schools, as well as on commencing their studies.

As the American Public Health Association is an international association which has representatives and influence in all of the four countries that occupy the North American territory, it would be desirable, that it should make its powerful voice heard and adopt similar resolutions, recommending their observance to the school and sanitary authorities as well as to the governments of those countries, so that they could be applied in practice.

This would certainly exercise a great influence in the preservation of the eyes of the children and would take from the schools the reproach that they are instruments of physical degeneration, instead of being an essentially civilizing means of culture.

I therefore have the honor to submit to the deliberation of this Association, the following resolution:

WHEREAS: the sight and hearing of school children is of inestimable value for their future, and it has been proved that scholastic life aggravates the defects of the sight and also that the want of proper care aggravates the affections of the ear, with the result that these conditions retard the progress of learning and conspire against the health of the child;

Be it resolved: that the American Public Health Association recommends that measures be taken by the various school authorities and boards of education, boards of health and if possible, by the several governments of the countries of North America, to secure examinations of the eyes and ears of all school children, with a view to their suitable treatment for the relief of the opthalmologic and otologic imperfections.

SOMETHING ABOUT THE BACTERIOLOGY AND CLINICAL HISTORY OF PLAGUE.

By O. GONZALES FABELA, M. D., Mexico D. F.

All who practice bacteriology know that many of those who do not practice it frequently wish to obtain from bacteriology much more than it can furnish, to help in diagnosis and, in such terrible epidemic diseases as plague, to justify the very rigorous methods of the sanitary police, that are based upon that diagnosis, directed to prevent the progress of the epidemic and to order the correct treatment of those attacked. On the other hand, it may be observed in the schools, that from the beginning of bacteriology, the clinical picture has been more or less neglected, notwithstanding that before we had bacteriology, diagnoses were made and, that if sometimes mistakes occurred such diseases as the plague could be, as they can now be, diagnosed without the help of bacteriology.

The guardians of public health ought to bear in mind these considerations when dictating their orders, for the delay originated by the waiting of a complete report, that often is delayed quite sufficiently by the interests of every nature that are involved in such cases, brings as a result unfortunate consequences.

The Superior Board of Health of Mexico and very particularly its worthy president, Dr. Eduardo Liceaga, convinced of these ideas, when the plague appeared at Mazatlan, at the end of 1902, when he had the first news of the suspicious cases, and relying only upon the clinical characters that were communicated to him by telegraph, exactly valuing all of them (including the statistic facts), informing himself about the mortality of the rats, etc., dictated the necessary measures *as if it were a case of plague determined by bacteriology* and, to this rapidity in the orders, was doubtless owed in great part the succeeding success.

The results of the bacteriological investigation, which was confided to me, justified in this case in the most absolute manner his orders and plainly authorized him to make the official declaration.

The annotations that follow have been taken from the report I rendered to the board of health of my work during this, the first appearance of the plague in my country.

In the pavilion of those that were convalescent, I found eight patients, all of them with buboes, painful enough, notwithstanding that some of them had already been two or three weeks in apyrexia. In

the pavilion of the patients, I saw seven, two of them were seriously ill. These were a woman, who presented the intestinal form, and a man who, at first sight, seemed to be attacked by the pneumonic form. From the examination I made of this last patient, with the greatest care possible, it seemed to me, clinically, that I was confronted by a typical case of plague, of bubonic form, complicated with broncho pneumonia and very serious; all these were circumstances that made the case completely appropriate for bacteriological investigations; because in the buboes and expectoration, the causative bacillus should be found almost surely, if the case was one of plague, and in the blood probably also. Fortunately for my work, but unfortunately for our Republic, the results corresponded in the most complete manner with these suppositions, and the diagnosis was strengthened more and more by the bacteriological evidence.

CLINICAL PART.— Natividad Acosta, a man about 35 years old, married, of the mestee (mixed aborigine and white) race, native of a place distant from the coast about 30 leagues, lived in Mazatlan four years ago. He is of a strong constitution; he has not been infirm. One year ago, he had fever that lasted a few days. He is a wagon man of those that are charged with the cleanliness of the city.

His illness began on the 25th December of last year and it made its evolution in the following manner.

December 25th. Intense cephalalgy and fever.

December 26th. The cephalalgy continues; a pain in the right groin; 39.8 degrees centigrades fever at night. In this day he entered the detention word for suspects, situated in the Civil Hospital.

December 27th. The pain in the groin is considerably greater; the cephalalgy persists; 38.5° in the morning, 40° at night.

December 28. A portion of the right groin appears swollen; delirium begins; cough and bloody expectoration; 40° morning and evening.

December 29th. Besides the symptoms that are mentioned hiccough begins; the swollen, painful portion in the groin enlarges remarkably; 40° morning and evening. In this day he entered the lazaret.

December 30th. He died at 5:30 p. m.

At the autopsy I made at 8 o'clock p. m. I did not find anything to catch my attention, except that the spleen was very large; I took some portions from one of the ganglions in the bubo, from the lungs, the liver, the spleen and the kidney that I put in pure alcohol to prepare them for sections.

At 7:30 in the morning of this last day, the hour in which I made the clinical examination of the patient, I made the following obser-

vations: his general aspect is that of typhus; restlessness, cough and hiccough. The patient is generally lying down upon his back, somewhat inclined on the right side. When he intends to raise for expectorating he with difficulty succeeds on the right side, trying to avoid the movements of the articulation of the hip. The face is rather of a violet color, the conjunctiva is normal, without jaundice, the tongue yellowish, with reddish sides. On the right groin a very remarkably swollen portion is observed, with a slight red color, that corresponds to the place of the syphilitic ganglionary pleiad. In the lower vertex of Scarpa's triangle, another swollen part is seen, both longitudinal and vertical. No petechiae exists, neither flictenae nor remarkable carbuncle.

By palpation it is observed that the swollen, upper portion of the right groin is doughy, very painful, that it is formed by four ganglions that are delimited with difficulty; the swollen, lower portion is of the same nature and in the left groin a slight, painful swelling is perceived.

The splenic area is enlarged by 34 milimeters, beyond the costal border over the anterior axillar line. The liver is depressed by 17 millimeters but the liver area is almost normal in extent.

In the thorax, physical signs of a general bronchitis are found.

The expectoration is mucous and bloody.

Temperature, 38.8°; pulsations, 120; respirations, 44; hiccough, convulsions, 16 a minute.

The urine is rather diminished, it presents albumin in remarkable quantity by the nitric acid test.

BACTERIOLOGICAL PART. — After the most careful cleanliness asepsis and antisepsis, I made a small incision on the upper swelling of the groin; through that incision I put a Pasteur's pipette into the periganglionic tissue, and drew up the serous, bloody liquid, with which I made:

1st. Microscopical preparations.

2nd. Cultures in broth, gelatine and agar.

3rd. Subcutaneous injection into a guinea pig, of a small drop in the right leg, a little under the knee.

I also made, only to comply with the request of the doctor who accompanied me, one fresh preparation of blood, in order to look for the Laveran's hematozoon.

The results were as follows:

1st. In the preparations made with the periganglionic juice, bacilli, characteristic in form and staining.

In the preparations of blood a very small quantity of bacilli. (The plate shows in one field, many bacilli from different fields brought together schematically.)

In the preparations of expectoration numerous bacilli, almost without any other bacteria.

In the ganglionic and pulmonary sections bacilli are seen in extraordinary quantity; they are not in the spleen, liver and kidney sections.

2nd. Broth. After 24 hours a slight growth appears, with the proper characters of the plague bacillus; at the same time, in the condensation liquid of the agar, characteristic chains of the growth of the bacteria in liquid medium are seen. The bacillus is without motion.

AGAR.—After 24 hours one or more characteristic colonies are hardly to be distinguished on the surface of the seeded agar; after 48 hours the growth is very apparent.

GELATINE PLATES.—On the third day abundant characteristic colonies.

GELATINE STAB CULTURES.—An inoculation from the liquid of the condensation of agar produces a growth quite apparent after 48 hours. It does not liquefy gelatine.

SERUM.—The inoculation from the condensation liquid of agar produces colonies 48 hours later.

3rd. The guinea pig that was inoculated on the 30th December began to be ill on the 2nd January morning; after some hours of convulsions it died at 1 o'clock p. m. In the autopsy I found a bubo in the groin, on the side of the infection, and ovoid.

The film preparations made with the juice of the bubo, liver and spleen of the guinea pig show plenty of characteristic bacilli.

The mortality is a further proof that strengthens the diagnosis. During the last 18 days of December there were 72 deaths, and 8 convalescents only, (90 per 100).

OFFICIAL REPORT OF THE PROCEEDINGS OF THE THIRTY-FIRST ANNUAL MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.

MONDAY, OCTOBER 26TH.

The Section of Bacteriology and Chemistry held its meetings in the Medical Department of the Columbian University, under the Chairmanship of Dr. H. L. Russell, of Madison, Wis.

TUESDAY, OCTOBER 27TH — FIRST DAY — MORNING SESSION.

The Association met in the Assembly Hall of the New Willard Hotel, and was called to order at 10:20 A. M. by the President, Dr. Walter Wyman, Surgeon-General of the Public Health and Marine Hospital Service, of Washington, D. C.

In calling the convention to order, President Wyman said: It becomes my pleasant duty to call to order the thirty-first annual meeting of the American Public Health Association.

It gives me great pleasure to present to you a gentleman whom it is not necessary to introduce to the individual members of this Association, a former President of the Association, who by his scientific attainments and public service has endeared himself to us all. I have the honor of introducing to you General George M. Sternberg. (Applause.)

General Sternberg then delivered the Opening Address. (See p. 13.)

THE PRESIDENT.—The next order is announcements by the Chairman of the Local Committee of Arrangements, Dr. W. C. Woodward.

DR. W. C. WOODWARD.—There will be an excursion to the vaccine farm of the National Vaccine Establishment, College Station, Maryland. Electric cars leave Fifteenth and G. Sts., N. W., at half past twelve o'clock sharp, Wednesday, October 28th. They will return in time to permit members to attend the afternoon session. Luncheon will be served during the excursion.

There will be an excursion to Mount Vernon on Friday afternoon, and tickets will be distributed to those members who have registered.

Wednesday, October 28th, at 8 o'clock P. M., there will be a reception tendered in honor of the Association on behalf of the citizens of the District of Columbia, at the New Willard Hotel.

Thursday evening there will be a reception tendered the Association by Hon. and Mrs. John B. Henderson at their residence, located at the intersection of Florida Avenue and Sixteenth Street.

THE PRESIDENT.—We will now listen to the report by the Secretary.

THE SECRETARY.—Mr. President: Some communications have been received which I will present. (Several letters were here read.)

At the last meeting, an amendment to the Constitution was offered, and it seems appropriate that it should be voted on at this time. It will be found in the official announcement that has been sent to all members. It is an amendment to Section IX of the Constitution. The section follows, with the new matter in italics:

EXECUTIVE COMMITTEE.

IX. The Executive Committee shall consist (1) of the President, First Vice-President, Second Vice-President, Secretary, Treasurer, and Chairmen of the various sections; (2) of six active members, of whom three shall be elected annually by ballot to serve two years, and who shall be ineligible to re-election for a second successive term; and (3) of the ex-Presidents of the Association; (4) *of the Chairman and Secretary of the Laboratory Section and the retiring Chairman of that Section.*

It shall be the duty of the Executive Committee to consider and recommend plans for promoting the objects of the Association, to authorize the disbursement and expenditure of unappropriated moneys in the treasury for the payment of current expenses; to consider all applications for membership, and at the regular meetings, report the names of such candidates as a majority shall approve; and, generally, to superintend the interests of the Association and execute all such duties as may, from time to time, be committed to them by the Association. At least one month preceding the annual meeting of the Association, the Executive Committee shall cause to be issued to members a notice of such meeting, and they are authorized to publish the same in medical, scientific, and other periodicals, but without expense to the Association; and such notice shall contain the order of business to be followed at said meeting, and, briefly, the subjects to be presented and the special points of discussion.

THE PRESIDENT.—Is the Association ready to vote on this amendment to the Constitution? Will some one make a motion that the amendment be adopted?

GENERAL STERNBERG.—I move the adoption of the amendment as read. Seconded and carried.

THE PRESIDENT.—The Secretary will now read the list of applications for membership, which have been acted upon favorably by the Executive Committee, and are recommended to the Association for election.

The Secretary presented a list of applications for membership, and, on motion of Dr. Kober, the Secretary was instructed to cast the ballot of the Association for the election of the gentlemen whose names had been read, which he did, and they were declared duly elected.

THE PRESIDENT.—In the absence of the Chairman of the Committee on Car Sanitation, we will pass this report temporarily, and listen to the report of the Committee on Animal Diseases and Food, by Dr. D. E. Salmon, Chief of the Bureau of Animal Industry, Washington, D. C., Chairman. (See p. 20.)

DISCUSSION.

GENERAL GEORGE M. STERNBERG, Washington, D. C., was asked to open the discussion on Dr. Salmon's report. Mr. President: This is a very interesting report. It seems to cover the ground very fully and shows conclusively that Koch was mistaken in his conclusions, and that bovine tuberculosis can be communicated to man. It brings up the point that the tubercle bacillus, like other known pathogenic bacteria, shows great variability. The Berlin or Koch school has been disposed to differentiate very closely between pathogenic bacteria and to draw specific lines, upon slight differences in biological characters. Pasteur, in his earlier researches, showed how attenuated varieties might be produced; how a certain bacillus might be cultivated in such a way so as not to form spores. We know that motile bacilli may lose their motility; we know that pathogenic bacteria may become practically non-pathogenic as the result of cultivation. We find that, for instance, in the case of the diphtheria bacillus. The tubercle bacillus shows the same characteristics, and the varieties depend in a large measure upon the manner in which it has been cultivated. It may even show decided changes in its morphology, so that the hard and fast rules which the Koch school has attempted to lay down have been broken down, to a great extent. We have now, instead of distinct species, groups. We have the colon group, the typhoid group, and the tuberculosis group, including their many varieties.

I do not think there is anything more, Mr. President, I can say on this subject.

DR. GARDNER T. SWARTS, Providence, R. I.—In connection with the consideration of the transmission of tuberculosis by milk, we have been led to believe that the only means of transmission is in the presence of a diseased condition of the udder with the invasion of tubercle bacilli. But we lose sight of the important fact, when we stop to consider it, that the greatest amount of dirt accumulates in the milk during the process of milking by the shaking of the hide and udder. The milk coming from the udder is sterile, and the contamination of the milk after it leaves the milking farm may be slight, but the gross contamination occurs from disturbing the dirt on the surface of the animal. We should not lose sight of the fact that those animals that would

naturally have tuberculosis are usually, in the later stages, in a condition, where the secretions from the lungs are brought to the mouth and tongue by the act of coughing.

Farmers place considerable value on cows when they know they are almost ready to die of tuberculosis. A farmer allows the disease to advance until the cow is absolutely worthless as a milking animal, until the animal practically coughs its head off, and I think as such, the animal is in a condition not only to cough this mucous material into the atmosphere, but to leave it on the hide and have it transmitted to the milk.

Consider that the animal scatters this mucous secretion over her hide while lapping her sides or throwing her head against her body to drive away flies. Again it is a common thing for animals to lap the hide of other animals presumably for the purpose of securing the salt which has exuded with the perspiration, and thus a non-tuberculous cow may have her hide well laved with mucous from the mouth of a cow suffering from pulmonary tuberculosis.

That animals are allowed to get into a condition to spread infection in this way is shown by the fact that in those states where an allowance is made for the destruction of a cow suffering with tuberculosis, the animal is allowed to get into an advanced stage of the disease before the state's appraiser is called in.

DR. JUAN GUITERAS, Havana, Cuba.—I would like to ask whether any investigation has been made in this direction, that is, a comparison made between those countries in which boiled milk is used exclusively and those countries in whick milk is frequently used raw?

It seems to me, that the results we find in the tropics, in Cuba especially, rather tend to show that the transmission of tuberculosis through milk is not as frequent as we are generally led to believe in childhood. It is undoubtedly a fact that no milk is ever used in Cuba that is not boiled, and here, as we know, milk is frequently used unboiled; yet I believe infantile tuberculosis is as frequent in Cuba as it is anywhere else.

DR. L. A. SEAMAN, of New York, N. Y.— Mr President: As tuberculosis is such a general disease, existing practically everywhere, and there are local conditions which make such a difference in tuberculosis in various countries, it is impossible to draw any conclusions as to the etiology of the disease from the number of cases so far seen. It may be, that there is as much tuberculosis in Havana as there is in other countries, and it may be they sterilize their milk more than we do; at the same time, it might also be the case that if they did not sterilize the milk, they would have more tuberculosis than they now have.

Evidently, from the facts which have been brought out in these experimental investigations, it is the children who suffer most from infected milk. Nearly all bacilli virulent for cattle have been obtained from children. I only know of one or two cases where virulent tubercle bacilli have been obtained from others. This would seem to indicate that children are more susceptible to infection in this manner. In order to draw any conclusions as to the extent of tuberculosis in any state or in any country, it would be necessary to scrutinize carefully the amount of tuberculosis in children at the milk drinking age. Possibly we could get some indication from that, and possibly we could not. I think the test which Dr. Smith made, testing the virulence for cattle bacilli from persons affected with the disease, is the most direct and the most conclusive evidence that can be obtained. I am satisfied that we will not go far wrong in accepting the results drawn from those experiments.

DR. CARLOS J. FINLAY, Havana, Cuba.— I only want to make a few remarks about what Dr. Guiteras has said. I do not quite agree with him. I only make comparisons with other countries, but I believe in Cuba the statistics show clearly that tuberculosis among children is immensely less than amongst adults. I have for a long time noticed that the greatest mortality from this disease in Cuba occurs between the ages of fifteen and sixteen. I would suggest that all boards of health, if possible, furnish data on this subject for the next meeting of the Association, in order that we may be able to come to some definite conclusions. The difference is well-marked in these ages between our country, Cuba, and in other countries where milk is only given to children boiled. Our people generally boil the milk several times in the the course of the day, and yet it is inferred by some that milk infection is an important factor.

DR. J. M. LINDSLEY, Havana, Cuba.— While on the island I found that one-sixth of the population in the cities died of tuberculosis. I do not believe that the people in the country are in the habit of boiling milk before giving it to the children. The Americans, as a factor in the problem, do not boil their milk, as a rule, but drink it as it comes from the cow. I do not remember any case occurring among the American people on the island while I was stationed there.

There are three factors in tuberculosis which should be considered. I do not believe that consumption is a contagious, infectious, or hereditary disease, in the strict definitions of those words. Consumption is a product of wrong living, and that wrong living may be taking the milk of tuberculous cows; it may be by living in a house which we would consider a tuberculous house. In Cuba we find that a great many of the houses are built on low flat land. In these houses, we find from

five to six feet of the wall absolutely wet, and when a person goes into such a house and sleeps, we know the natural heat of the body is taken off and reduced below normal. In that climate we find many consumptives in the city; but up on the mountains and in the rural districts we rarely ever find tuberculosis. In Santiago and Cienfuegos, I should say that one-sixth of the population die of tuberculosis. In Ciego de Avila I saw only one case of tuberculosis out of a population of three thousand people. These people, I am satisfied, do not all boil their milk. They drink it and give it to their children as it comes from the cow. Some of them use goat's milk, and we seldom see tuberculosis amongst the children.

DR. JUAN GUITERAS, Havana, Cuba.— I must insist that milk is always boiled in Cuba, and nobody thinks of giving it to children unless it is boiled. Generally, it is boiled two or three times a day. It is almost an invariable rule to boil the milk three times a day there.

DR. L. A. SEAMAN, New York.— I would like to ask whether the cattle in Cuba have any tuberculosis or not. We have found that by testing cattle from different sections of the world, some of them have tuberculosis, while others have not. I do not think anyone claimed that tuberculous milk is the only factor which produces tuberculosis in man, but in certain countries where cattle are infected with tuberculosis it is an important factor.

DR. CARLOS J. FINLAY, Havana, Cuba.— Investigations have not as yet been made in Cuba with regard to testing cattle for tuberculosis. We have not been able to get a number of cows placed at our disposal for this purpose, consequently we cannot give statistics.

Dr. Granville P. Conn, Concord, N. H., read the report of the Committee on Car Sanitation. (See page 167.)

Dr. John N. Hurty, Indianapolis, Indiana, read a paper entitled "Transportation of Persons Sick with Transmisible Diseases." (See page 184.)

Dr. Juan Breña, Zacatecas, Mexico, read a paper on "Car Sanitation in the Republic of Mexico." (See page 188.)

The time for adjournment having arrived, Dr. William Bailey, Louisville, Ky., moved that the discussion on car sanitation be postponed until the afternoon session, and that the Association now adjourn until 3 P. M. Seconded and carried.

FIRST DAY — AFTERNOON SESSION.

The Association reassembled at 3 P. M., and was called to order by the President.

DISCUSSION OF THE PAPERS ON CAR SANITATION.

DR. SAMUEL W. ABBOTT, Newton Centre, Mass.— Mr. President: There are two topics relative to railway transportation which are prominent in the discussions of sanitary organization:

1. The transportation of the living.
2. The transportation of the dead.

As a matter of direct relation to the public health, the former is at least a hundred times more important than the latter.

There is no very definite evidence that the dead body, shut up tightly in its coffin and this surrounded by another wooden covering, constitutes a serious menace to the public health. Evidence that epidemics of disease, or even single cases of illness in large numbers, have been caused by the transportation of human bodies, is wanting. While, on the other hand, hundreds of epidemics and thousands of cases of infectious illness are known to have been caused by the traveling to and fro of persons sick with infectious diseases.

In an investigation as to the causes of disease in Massachusetts made in 1891, covering a period of twenty years, it was found that out of ninety-five towns in which there had been no deaths from measles in twenty years (1871-1890), 44, or nearly half, were not upon any railway line. There are also fifteen towns in which no deaths from scarlet fever had occurred in twenty years, and eleven of these were remote from any railway line. There were only two towns in which no deaths from diphtheria had occurred, and these two were remote from a railway line. With reference to the still more infectious disease, smallpox, deaths had occurred in 161 towns, mostly in the epidemic of 1872-1873, but all of these 161 towns, except eight, were upon some railway line.

When a man is alive and breathing and casting out sputum and other excreta, he is, if ill with infectious disease, far more dangerous to the community than a human body shut up in a coffin.

I have listened to Dr. Conn's report with a great deal of pleasure, especially with reference to what he said about Pullman cars. As a matter of fact, they are just where they were the first time I rode in one, which was in 1867 or 1868. They have not improved much since that time. When a man is shut up in the lower berth of a Pullman car, breathing his own carbonic acid gas, he is in about as bad sanitary condition as the man who is shut up in a box at the end of his life. So I take by preference a steamer whenever I can get one, because one has better ventilation, and can usually get a good and well ventilated stateroom. Of course, one can get a stateroom on a Pullman car, but it is not to be compared with a good berth on a steamer,

so far as ventilation is concerned. In traveling from Berlin to Munich, or from Munich over the Alps, you can get a good stateroom, as good as you see on the average steamer in this country. That has been the case for fifteen years, at least, in foreign countries, and why should we not have the same privileges in America?

With regard to the matter of furnishings in these cars, and as to whether impermeable substances are as good or not so good as plush fittings, it seems to me the simpler the furnishings the better. They are more easily cleansed. Of course, there may be good reasons presented on the other side. On the whole, we should teach people not to void their excreta in cars.

There is one other disease that has not been mentioned. I have been riding about twenty miles a day in a railroad car in single trips, and have seen many cases of children with whooping-cough. In our statutes relative to exclusion of school children there is not a word said about whooping cough; they refer to smallpox, diphtheria, scarlet fever and measles. Children are excluded from the public schools who have these diseases. Whooping cough is almost as dangerous. Thirteen thousand people died of it in our State, in 20 years. These are nearly all children, and almost all of them under two years of age. Children catch it frequently by traveling in railroad cars. Two or three months ago I saw a child traveling with its mother, the child having whooping-cough and vomiting in the car. Just behind the mother there was another child exposed to the disease, and its mother would have a serious time with it sooner or later. I informed her of the danger to her child, and tried to induce her to take a seat in the rear of the car, but just at that moment the other occupants went out. I simply cite this case to show how children may contract disease on any cars, and I think this Association should put itself on record in regard to the subject, and especially with reference to the general unsanitary character of those of the Pullman type.

DR. CHARLES B. DUDLEY, Altoona, Pa.—This subject of car sanitation impresses me somewhat as having two sides to it. There is the side that presents itself to the public, and there is the side that presents itself to the railroad man. Both sides I am confident, need information from the other. The ordinary railway operating officer, I am sure, does not fully appreciate the situation. On the other hand, the public does not know anything about what the railroads are doing. I might say, that the Chairman of the Committee on Car Sanitation asked me to prepare a paper from the railroad standpoint. Many of you know that I am a chemist of the Pennsylvania Railroad, and I was asked to prepare a paper giving information from the side of the railways. I was compelled to decline on account of pressure of work.

I am sorry that such is the case. Possibly later I may be able to do so. As I have read the reports of this committee from time to time, I seem to have observed that the side of the public has been pretty well presented. Isolated cases of filthy conditions that each one of you may meet, which are loaded up with words, and which present the case in all of its degradation, if I may use the word, have found their way into the reports pretty well. Operating railroad officers regret that state of affairs as much as you do. On the other hand, there is very little known yet of the efforts made by the railroads to keep cars healthy. I say that emphatically, and I have done some work myself along that line. It is hardly possible for me to pick out the details and discuss at this time the whole question, but I would like to touch on one or two points which have been brought before you. First, in regard to ventilation of cars. It is said that railroad cars are badly ventilated. We agree to this, but until within two or three years, we have not known how to successfully ventilate a passenger car. Many schemes have been proposed and much study embracing a number of analyses of the air in cars, has been put on the subject. Finally as the result of several years' study by the various experts of the Pennsylvania Railroad, a system of ventilation has been developed which we think gives us very satisfactory results. We are actually able to take 60,000 cubic feet of fresh air per hour through the car, warm it for comfort in cold weather, and with a control over the system for adverse conditions, such as going through tunnels or when very few people are in the car, reducing the total amount of air taken into the car about one-half. The results of this study with a complete description of the system, have been published in the American Engineer and Railroad Journal. The Pullman car has not yet had the system applied to it. The difficulties in ventilating a Pullman car are much greater than those in ventilating a passenger coach. The changes in construction involved, to adapt the system to a Pullman car, are quite serious, and it will probably take some considerable study and time, before the Pullman car can be said to be well ventilated.

At this point perhaps I may say that we have heard much said about the danger of contracting disease on passenger and Pullman cars. On the other hand, those of us who are interested in railroad work, have felt compelled to ask ourselves the question, what the evidence is, that passenger cars are unhealthy. It may not be generally known, that the air from passenger cars has been examined bacteriologically a number of times, mostly with negative results. Those experiments were made under the control of the President of this body, namely, the Surgeon General of the United States Marine Hospital Service. We have been urging that these experiments should be carried farther,

and that very careful study should be made on the subject. It is our sincere hope that the question will be taken up again by the United States Marine Hospital Service, and I think I need not say that the railroads will co-operate in the most hearty manner in attempting to set this question at rest. We cannot help feeling that before expensive changes are made in the construction of cars, we ought to have as positive information as it is possible to get.

The apartment Pullman car has been tried, and some of the best trains run one car of this kind now, but the difficulty seems to be that the general public do not yet sufficiently care for the exclusion and protection which an apartment car gives, to be willing to pay the necessary increased cost.

In regard to the material from the cars scattered along the track being a source of danger, I think we can all see that this may be a source of danger, but unfortunately we do not at present know of any successful means of handling this material in any other way. The dry earth closet has been tried, but none of them that have been tried, have been found successful in their operation.

In regard to the healthfulness of the water supplies, we are constantly examining the water supplies all along the line of the whole Pennsylvania System, both chemically and bacteriologically, and are using our utmost exertions to exclude from the service any water that is inferior. Experiments in regard to furnishing passenger cars with sterilized water are in progress, but thus far no sterilizer has been found that is applicable to the car supply. We are in correspondence with those who have put most study on this subject, and have written them a number of times, urging especial attention to the development of a successful sterilizer that can be applied to car water supplies; but as yet without result.

The cleaning of cars in transit is one of the most difficult subjects that railroads have to contend with. The matter has been much discussed in committee of the officers, with the conclusion that the best that can be done at present is to use a brush on the end of a long handle for the cleaning of the cars in transit, with an occasional use of a damp mop. It is more than possible that further study along this line may lead to such modifications as will produce better results. At this point I may say I am confident the public does not understand how much effort is put on the cleaning of cars at the end of the run. It is hardly possible to go into the detail of what is done in the way of car cleaning at terminal points. It would take a long article to describe this.

Another point, namely, the disinfection of cars. Very much study has been put on this subject, and while it is not yet completely worked

out, we have made a good deal of progress we think in the last two or three years. When the subject was first taken up about three years ago, there was so much confusion as to what is the best method of disinfection, that we were absolutely compelled ourselves to put to test by positive experiment, the various methods suggested. One manufacturer of a disinfecting apparatus stated, for example, that it was essential to have dry formaldehyde gas in order to produce disinfection. Another manufacturer stated that his apparatus gave just the right amount of moisture in the air, while a third stated that moisture in the air was essential. Without going into detail we may say that our experiments seem to confirm the latter view, namely, that disinfection does not take place unless the air contains a good deal of moisture. To give you a few figures: If the moisture in the air is below 50 per cent. of the amount that it can contain at the temperature, we almost universally fail in producing disinfection. From 50 to 70 per cent. we get occasional disinfection, while above 70 per cent., formaldehyde apparently produces complete disinfection, and that too in a very short time, especially if the air is pretty near saturation in content of moisture. We are still struggling with a method of getting a large amount of moisture in the air along with the formaldehyde gas in a short space of time. Our experiments indicate that if we can boil away at least two quarts of the solution containing the proper amount of formaldehyde gas in fifteen to twenty minutes, we will get complete disinfection of a passenger car in at least half an hour. But what apparatus to use in order to do this is not yet apparent. Most of the apparatus now before the public requires from one to one and a half hours to get the proper amount of gas into a car, and then requires to have it act for a long period of time. We regard this as an imperfect system.

In regard to the transportation of the sick, I may say that the railroads are as much annoyed at this feature, as the public can be, but our difficulty is that our ticket agents, and our conductors and brakemen are not physicians, and cannot diagnose cases. In every case where diagnosis is clear, as for example where a person is sick with smallpox, we either refuse transportation, or take the person so afflicted off the cars at once, and close the car. But a person with incipient tuberculosis applies for a ticket. The ticket agent cannot say under present legislation at least, that he cannot sell a ticket, nor can the conductor or brakeman put the person off the train. It seems to us that the transportation of the sick, is a question for legislation, rather than a question for the railroads to handle.

Much more might be said on the subject, but I fear to weary you. I will conclude by saying that as fast as information that is safe to

act on, is obtained, I am confident the railroads will utilize this information, and that too without raising any question whatever, but we cannot feel that it is the right thing to compel us to act on half information or on information that is supported by no greater evidence than the fear of acquiring disease.

DR. J. M. LINDSLEY, Havana, Cuba.— I would like to ask why the railroads persist in using dark colored blankets instead of white blankets, which would show when they are soiled?

DR. DUDLEY.— I think the best answer I can give to that question is that there is an enormous amount of dirt around railroad cars that is not pathogenic, (laughter) and if you use a white blanket, you get in a short time so many stains on it from non-pathogenic sources that it becomes only fit to be burned up. So far as I know, the cleaning can be just as well done with a colored blanket as it can with a white one. Perhaps no more cleaning would be done if the blankets and everything else were white, than if they were colored.

DR. J. N. MCCORMACK, Bowling Green, Kentucky.—This subject is especially interesting to me because my board has been wrestling with it vigorously for more than a year. In my State the law gives us authority to make regulations governing these matters. The board, through its proper committee, first formulated some suggestive rules and regulations covering the whole question, and, having found from experience in quarantine matters that the railroad companies were quite as anxious as we were to protect the public, these regulations were submitted to the various railroad corporations operating in and through Kentucky. We asked them to criticize our suggestions, so that we might get what was so desirable with the least interference in the affairs of the companies.

Within the last ten days I was present at a meeting of this committee, at which there were represented all the great railroad lines which operate in our State — the Louisville and Nashville, Pennsylvania, Monon, Illinois Central, Chesapeake and Ohio, and several others. We had the benefit of the opinions of experts or representative men that were present from all of these corporations, and went over the whole matter with them very carefully. We found, as we believed we would find, that they were quite as anxious to solve these problems as we were.

We found that they were making careful and painstaking attempts to cleanse their cars at destination, that is, the ordinary day coaches, and that their methods of cleaning and disinfection were in the main very satisfactory. They were glad to receive suggestions from us, and so expressed themselves. They were naturally anxious that the regulations should be in accord with those of the adjoining States, and, of

course, they were anxious that no experimental regulations be made involving great expense to the companies which in the end might turn out to be unsatisfactory. After a protracted session, in which the whole ground was gone over carefully, the matter went back to the board, and it is now in our hands for further elaboration, in the light of the suggestions made by the experts from these various companies. I am quite sure, that that meeting fairly represented the sentiments and feelings and policies of the railroad companies.

Dr. Dudley has discussed the report of the Committee, and the statements made by him have been borne out. I have been an executive officer for nearly one-quarter of a century, and that extended experience has borne out what he has said. Some of their methods are crude, it is true, and I presume that we are sadly in need of investigation along all these lines, so, that in some way, not one, two, nor three state boards, but all of the States of this Union and contiguous countries should be in possession of accurate information for themselves and these companies with it. I feel quite sure they are ready at all times to adopt any practical suggestions we may make.

Our investigation started with the Pullman Car Company. The superintendent of that company was represented at our first meeting, and some of his statements were rather surprising to me. I have listened with interest to what Dr. Dudley said about the reasons for the blankets being of a gray color, but I feel sure that, in the light of the statements of the gentlemen representing the Pullman Car Company, that he does not state all the reasons. We were furnished with elaborate-looking regulations for the cleansing of the Pullman cars; but after they were through, as has been a long established habit with me, I asked some plain questions. I said, I would like to know, Sir, how often you wash your blankets? "Well," he said, "they always wash them every six months, at least." I suppose that meant whether they were soiled or not. I said, "Do you mean to say, Sir, that the blankets in these berths are not washed more frequently than once in six months?" He said they were not.

The methods of ventilation in the Pullman cars, as Dr. Dudley has said, are very crude. They are so imperfect that it is hardly worthy of the name of a system. The method of disinfecting or cleansing their blankets and mattresses and the heavy goods in the car, according to the statements of their representative, is even worse than the system of ventilation. It is no system at all. While at first it was thought no better fabric than heavy curtains and heavy window shades could be found, after a few months' investigation their representative appeared before us at this meeting ten days ago and submitted some fabric which in every way seems much more desirable. The company

is quite willing to have these blankets washed at shorter intervals, and at our suggestion is willing to put in plants for treating the mattresses and blankets at reasonably short intervals with superheated steam.

I feel sure it only needs a little positive action upon the part of a few states to secure a much needed reform in the method of cleaning and disinfecting their sleeping cars. I believe they are ready to do it when required to do so, and I am quite satisfied that the time has come for this. It is probable that we ought to have some experimental work done along this line also, but I am sure it will not require much work to satisfy any man who lives practically in sleeping cars, as many men do, that something ought to be done. I have been an inhabitant of one for almost every night for eighteen months, and I am fully of this opinion. I am satisfied that a change would be an improvement, and I do not believe it will require much experimental work to satisfy us that the blankets which cover the anatomy of promiscuous people, night after night, need washing at least as often as once in five months. (Laughter.)

DR. DUDLEY.—I would like to ask Dr. McCormack or anyone one question, How often does he suppose that hotel companies wash their blankets?

DR. M. HAASE, Memphis, Tenn.—I would like to ask Dr. Dudley if the Pennsylvania Railroad Company does not disinfect its own cars when it is known they have been in contact with contagious diseases?

DR. DUDLEY.—Always.

DR. HAASE (continuing).— I would like to ask Dr. McCormack if he allows the railroad company or companies whose lines run through his state to disinfect their cars when exposed to infectious or contagious diseases, or whether this is done under the provision of the state board of health?

DR. MCCORMACK.—I regret to say, that it is not done under the supervision of the state board of health. I believe, however, from the investigations we have made, it may be said that the disinfection of cars is fairly well done with formaldehyde, particularly when these cars have been exposed to infection. We have looked into this matter carefully, and have seen that it was well done.

DR. HAASE (continuing).—I wish to relate some of the experiences I have had with railroads in the South. A family of eight were *en route,* bound for Indian Territory. Memphis was the stopping-point. It was found that four members of the family had measles. They wished to continue the journey. We wired the proper person at the point of destination, and inquired whether they would be allowed to

go through. Permission was granted for them to go through, and the railroad company furnished a separate coach to carry them there. The railroad company was instructed that that car would have to be disinfected, and the reply was, "Doctor, we will return that car and have you disinfect it, as we have no apparatus for doing so."

Let me report another case, which was from Dr. McCormack's own state, Lexington, Kentucky. The patient was bound for Hot Springs, Arkansas, Memphis being the junction. The case was diagnosed in Lexington as specific disease, and was discovered at the union station, Memphis, and diagnosed as one of smallpox. The man was sent to the pest-house, and the case proved to be one of variola. The young man came from Lexington in a Pullman sleeper, and twenty-one or twenty-two people were exposed. The Pullman service was instructed in Memphis to have the car disinfected, and they said, "We would much rather you would do it, and give us a certificate of disinfection." On inquiry it was found that the company had no plant in Memphis for disinfecting their cars.

I would simply say, that while it may be true that the Pennsylvania System disinfects its own cars, disinfection is not practiced by the railroad companies themselves, in the South. We do nearly all of the car disinfection for the railway systems running through Memphis. It has been positively necessary in the two instances mentioned for the reason that the railroad companies had no plant with which to do it.

DR. CHARLES P. DUDLEY, Altoona, Pa.—I ought to say that I tried to make it clear that all disinfection of cars is not done by the railroad authorities themselves. We are working on a complete system of inspection and disinfection, but we have not got it worked out as yet. Last year we made considerable progress. We have fully determined the conditions under which formaldehyde does its work.

Now, it depends with us upon where the infectious disease occurs. If it arises at certain parts along the line, the car or cars are disinfected by the railroad company itself. At other places, it is done by the board of health.

DR. CONN (closing the discussion).—I have been much interested in Dr. Dudley's supplementary report.

I will say in this respect, that if I had had time to read my report in full, taking up the whole of Dr. Dudley's report to me, it would have saved much of this discussion.

I have only one thing to add in way of criticism of the report of Dr. Dudley, and in this there seems to be on the part of the railroad companies, as well as of the profession, a tendency to substitute disinfectants for absolute cleanliness. Let us use more soap and water, and intelligent labor, and let disinfectants alone. I have in mind the south

terminal station in Boston, where no disinfectant is allowed in or about the station. The superintendent says that he will shoot employes if he finds them using one odor to cover up another. Absolute cleanliness is what he requires. Any one of you in going into the toilet rooms of that station will be amazed at what true cleanliness will do. It was the first system in the country, that I know of, to adopt pay closets, and to show you how much the public appreciates them, at times fully eleven hundred people have used these pay closets in a single day. These pay closets are as good as you find in any bathroom in this hotel, and are watched over by men and women who take care of these public closets, night and day. True cleanliness is the motto: "Let disinfectants alone."

Dr. Dudley has answered most of the questions which have come up. He has explained to you the medico-legal aspect of the situation. You cannot ask anyone to place himself, or any corporation to place itself, in such a position that it is liable to be a defendant in a suit simply in a matter of transportation as a common carrier. So far as the matter of carrying contagious diseases is concerned, it is one for the public to consider, and of which this Association may be the means of awakening public attention, so that further legislation may make it a matter in which the railroads can act, but they cannot do so at the present time unless at great expense, and which the public would not stand.

While Dr. Dudley was explaining why the railroad companies use colored instead of white blankets, someone near by me suggested, Why do we wear white stockings instead of black? It is possible a moment's reflection may suffice to explain.

As to the matter of ventilation, Dr. Dudley failed to explain how he would regulate the sixty thousand cubic feet of air per hour in view of the difference of wind pressure of a train making ten and sixty miles an hour. We all know in a given aperture, more air will be forced in any opening if the pressure is made greater by the speed of the train.

In regard to the remarks of the gentleman from Memphis (Dr. Haase), and his inquiry, I would say that in a letter which I read in the report, it was stated explicitly why they could not disinfect railroad cars themselves, and they expected state boards of health to take charge of this work.

Such being the fact, then state and local boards of health hold the key to the whole situation.

Dr. John F. Anderson, of Washington, D. C., read a paper entitled, "Remarks on the Preparation of Vaccine Virus." (See page 221.)

DR. QUITMAN KOHNKE, New Orleans, La.— I move, Mr. President, that the discussion on yellow fever be placed on to-morrow's program instead of Thursday afternoon. Seconded.

DR. PETER H. BRYCE, Toronto, Canada.— I move to amend that this matter be referred to the Executive Committee. Seconded.

The motion, as amended, was carried.

Dr. Henry Mitchell, Asbury Park, N. J., Chairman, read the report of the Committee on Causes and Prevention of Infant Mortality. (See page 122.)

Dr. A. J. McLaughlin, Washington, D. C., read a paper on "Immigration and the Public Health." (See page 224.)

DISCUSSION.

DR. FREDERICK MONTIZAMBERT, Ottawa, Canada.— Mr. President: For the information of the essayist and that of the Association with reference to what the reader of the paper said about the introduction of undesirable immigrants over the Canadian border, I will say that under the laws of Canada such diseases as trachoma and favus are not now included among quarantinable diseases. Therefore, it is not possible to exclude or deport them; but the Canadian Parliament has passed the necessary legislation, and I am confident there will be no such trouble in the future as there has been in the past.

Dr. Henry M. Bracken, St. Paul, Minn., read a paper entitled "Pertaining to the Transportation of the Dead." (See page 193.)

DISCUSSION.

DR. QUITMAN KOHNKE, New Orleans, La.— Mr. President: There are two considerations which should govern us in the transportation of dead bodies: One, public safety, and the other, sentiment, the latter causing a desire on the part of the family or friends to care for the dead body in a manner satisfactory to their love for the relative or friend. I believe the safety of the public should not be infringed upon, but out of respect for the other consideration, nothing more should be done than is absolutely necessary. We know that bodies dead of contagious diseases are not as dangerous to the public health as they were supposed to be at the time these regulations were first operative. We know that bodies which have been buried for some time are not infectious; that the specific germ of the disease is destroyed by the process of putrefaction. Take, for instance, scarlatina. Some laws, locally applicable, prevent for two years the disinterment of a body dead of scarlatina, under the false supposition that the germ is danger-

ous for that length of time. We now know that the germ of scarlatina and the germs of other diseases are not dangerous for any long period after death.

Take the disease yellow fever. The transportation of a corpse dead of yellow fever is not at all dangerous if the mosquito transmission is the true method of the spread of that disease. From year to year newly discovered truths should operate in modifying the rules governing the transportation of the dead so as to meet sentimental desires, for sentiment in the transportation of a relative after death is very strong, and is by many people considered as above almost any other consideration. Nothing but the ascertained truth should operate against that sentiment, and a modification of the rules would be in order every year.

DR. ARTHUR NOLTE, of New Orleans, La.— I wish merely to correct a statement made by the author of the paper as to what the Louisiana State Board of Health is doing in examining embalmers. The essayist is in error. This is entirely out of my department, but I know that our Board has made a number of examinations, and it is required of all who wish to engage in the business of embalming.

DR. HENRY MITCHELL, Asbury Park, N. J.— This paper seems to invite an expression concerning certain features of the public agitation relative to the sanitary questions involved in the transportation of the dead, and I believe that when we review the discussions of the past few years it will be seen that the dangers to the public health which attend ordinary removal of dead human bodies for burial have been very much magnified. Dr. Abbott has truly said that it is improbable that any corpse is capable of communicating any disease when ordinarily boxed and transported, and attention should be drawn to the fact that persons who are actuated solely by the commercial idea have used their opportunity to obtain restrictions against competition in the business of preparing dead bodies for burial. This Association should avoid any action which will needlessly interfere with the transportation of corpses, and the encasing of human remains to prevent leakage of gases and fluids in transit should be supervised by the health officer at the place of shipment.

DR. JOHN N. HURTY, Indianapolis, Indiana.— In regard to the feature Dr. Mitchell has just brought up, I would call attention to the fact that unless dead bodies are very carefully prepared, they are liable to decompose. Fluids sometimes pass through the caskets and boxes which are offensive and poisonous. A body dead of diphtheria, prepared in the ordinary way, put in a coffin and box and hermetically sealed, carries no threat of transmission of the disease. But if the body is delayed on the road and if it decomposes and fluids pass from

it, there is great danger that blood poisoning may be contracted by handling. A general baggage agent of a very prominent railroad, when he was baggageman, was seriously poisoned by fluids from a dead body and nearly lost his life. He afterwards became a general baggage agent, and took an interest in this matter. The importance of thorough embalming, packing in cotton and sealing in a casket is so great as to demand our serious attention.

DR. JOSEPH Y. PORTER, Key West, Florida.— I was not able to attend the meeting of the Baltimore Conference of State and Provincial Boards of Health, therefore I would like to ask Dr. Bracken if I understood him to say that all former restrictions against the transportation of bodies dead of contagious diseases have been rescinded?

DR. BRACKEN.— The only bodies that are not allowed for shipment, according to the new rules, are those dead of smallpox and plague.

DR. J. N. MCCORMACK, Bowling Green, Ky.— It seems to me, because we have gone to one extreme in the past, we should avoid going to another extreme too rapidly in the present. It is possible that in the transportation of these dead bodies the danger is not great; but when we put that idea before the public without proper explanation, we are in danger of going back to the old system of public funerals, and the exhibition of those bodies to the public after they have reached the point of destination. If this were done, there would be danger from bodies dead of scarlet fever and all the other diseases mentioned. It is well for us to have that source of danger in mind, and not fly from extreme restriction to such extreme liberality as would give the public a false impression in regard to this matter.

Dr. Eduardo Licéaga, Mexico, Mexico, contributed a paper entitled "Reflections on the Desirability of an Agreement Between the Sanitary Authorities of Adjoining Countries for Mutual Defence Against Transmissible Diseases," which was read by Dr. Frederick Montizambert, in the absence of the author. (See page 43.)

DISCUSSION.

DR. WALTER WYMAN, Washington, D. C.— Mr. President: Dr. Licéaga has found it difficult to understand that the quarantine powers of the State are recognized by the Congress of the United States, and that while State authorities are required to maintain certain protective measures, there is no authority in the United States government to prevent them from taking such additional measures as they may think fit. In other words, the United States government may require a five foot fence, but cannot prevent a State from putting up a ten foot fence, and for a while the State of Texas made the period of detention ten

days instead of five. This ten-day detention has been done away with for some time, and the authorities only require now a period of five days' detention on the border. A notification, which is such an important matter, I have received from Dr. Licéaga, as he says, and he has been notified every week in the publications which have been sent him, giving him formal notification as well as other governments, of every bit of information in the possession of the Public Health and Marine Hospital Service of the United States.

Dr. Licéaga is quite correct in his accounts with regard to uncinariasis and the plague situation generally in Mexico. He displays a most noteworthy and commendable spirit, and accepted the offer which I made of sending an expert on uncinariasis. Dr. Licéaga gave him a formal letter of introduction to the governor of the province, and his findings were corroborated. Dr. Licéaga gave us all the information he possibly could. I had some doubts as to the extent of the disease, and I sent an officer to him in Mexico City, and he received him with courtesy and gave him every bit of information that was necessary for us to have. The Mexican government, I think, is deserving of the highest praise, not only for a spirit of amity in health matters, but also for the great efficiency in the methods displayed in stamping out the plague, etc. I wish to give public expression of my admiration for their intelligence and activity in this matter, for which we should be grateful ourselves.

DR. J. M. LINDSLEY, Havana, Cuba.— I am glad to see that the Republic of Mexico has taken such an important action in this matter. Any republic that can stamp out bubonic plague in six months is certainly able to cope with yellow fever. We have shown how yellow fever is stamped out. The great trouble is that there has been no co-operation among the States with the Public Health and Marine Hospital Service. If Mexico had organized early in the spring to eradicate yellow fever at Tampico and other places, in my opinion it would not have appeared in Texas as it did this fall. It is time to have an international quarantine system, doing away with State quarantine. Let the United States government be represented, let the Mexican government be represented, the Republic of Cuba, and all of those countries in the tropics that have a close connection with the Southern States. The fear of yellow fever in the southern ports to-day is costing our country more than all of the epidemics we have had. It is not a question of whether a fence is five or ten feet high; it is a question of abolishing that fence entirely. We know the cause of yellow fever; we can go over to Mexico and with a few thousand dollars, without quarantine, wipe out yellow fever in its incipiency, and

not let it spread as it has this year to the state of Texas. Let me tell you how this thing is done.

In the South the States will not take the report of the Public Health and Marine Hospital Service. They send their own men into the countries, and these men are sent there at the expense of the steamship line, and these expenses are heavy. Why does not Cuba co-operate with the Public Health and Marine Hospital Service? They send a man over to Tampico to make reports for Cuba. Why not take the representative of the Public Health and Marine Hospital Service at Tampico? The health service in Cuba is good, and the Public Health and Marine Hospital Service should co-operate with that, so that if a case of yellow fever occurs, then let the Public Health and Marine Hospital Service send a man there to verify and see whether the authorities are doing their duty or not.

It is astonishing to see the people, who have charge of the public health of our country and in our States, not co-operating with one another, and until we can get the co-operation of the South with the Public Health and Marine Hospital Service, it is not easy to get the other republics to co-operate with us.

PROFESSOR FRANKLIN C. ROBINSON, Brunswick, Maine.—I believe the paper of Dr. Licéaga calls for the appointment of a committee. Is it the desire of the Association that such a committee be appointed as was asked for? I suppose this Association has no authority to do anything. I move that the matter be referred to the Executive Committee. Seconded and carried.

THE PRESIDENT.— It will be so referred.

On motion, the Association then adjourned until 8 P. M.

FIRST DAY — EVENING SESSION.

The Association reassembled at 8 P. M., with the President in the chair.

The President invited all ex-Presidents who were present to take seats on the platform, and those who accepted were Drs. Montizambert, Lee, Lachapelle, Bryce, Lindsley, Sternberg and Mitchell.

After a musical selection rendered by the Marine Band, the President introduced the Hon. H. B. F. McFarland, President of the Board of Commissioners of the District of Columbia. (See p. 17).

The Second Vice-President, Dr. John L. Leal, of Paterson, N. J., then introduced President Wyman, who delivered his annual address. (See p. 1.)

On motion, the Association then adjourned until 10 A. M., Wednesday.

WEDNESDAY, OCTOBER 27 — SECOND DAY — MORNING SESSION.

The Association met at 10 A. M., and was called to order by the President.

Dr. Woodward made some announcements in behalf of the local Committee of Arrangements.

THE PRESIDENT.—We will now listen to the report of the Executive Committee by the Secretary.

THE SECRETARY.—The following resolution was presented to the Executive Committee, adopted by that body, and is now recommended to the Association for similar action:

RESOLVED, That in view of the fact that the American Congress on Tuberculosis is to hold a meeting in Washington in April, 1905, the American Public Health Association does hereby approve and endorse the aims and objects of said Congress, organized in New York in 1902, with the following officers:

President, Dr. Daniel Lewis, Commissioner of Health State of New York, New York City; Secretary, Dr. Geo. Brown, Atlanta, Ga.; Treasurer, Dr. Peter H. Bryce, Toronto, Canada, Secretary Provincial Board of Health.

THE SECRETARY.—Another resolution in connection with the one already read, moved by Dr. Lee, and seconded by Dr. Bryce, is also recommended to the Association for adoption. It is as follows:

RESOLVED, That this Association having appointed delegates to said Congress would further urge all legally constituted medical societies, and all National, State and Provincial Boards of Health throughout the American States and Provinces, to appoint delegates to said Congress and to urge all physicians and others interested in the suppression of tuberculosis to become members of same.

On motion, the two resolutions were adopted.

THE PRESIDENT.— There is a matter of unfinished business which I am instructed by the Executive Committee to announce to you. In the discussion on human and bovine tuberculosis, through some strange oversight the name of Dr. Ravenel, of Philadelphia, was omitted from the printed program. It is an important paper, one which I, as President of the Association, personally by letter, requested Dr. Ravenel to prepare, and he kindly consented to do so. So the first paper upon to-day's program will be one on "Human and Bovine Tuberculosis," by Dr. M. P. Ravenel, of Philadelphia, Pa., Assistant Director of Phipps' Institute. (See p. 31.)

Mr. Rudolph Hering, New York City, read the report of the Committee on Disposal of Garbage. (See p. 129.)

Mr. C. E. A. Winslow, Boston, Mass., followed with a paper entitled "Some Statistics on Garbage Disposal." (See p. 141.)

Colonel W. F. Morse, New York City, contributed a paper on "Sanitary Disposal of Municipal and Institutional Waste." (See p. 134.)

On motion, the discussion on the papers on the disposal of garbage was postponed until the afternoon session.

On motion, the Association adjourned until 3:30 P. M.

SECOND DAY — AFTERNOON SESSION.

The Association reassembled at 3:30 P. M. and was called to order by the President, who announced that the first order was the discussion of the papers on the disposal of garbage.

DR. PETER H. BRYCE, Toronto, Canada.—Mr. President: There was one feature of the report which was interesting to me, but which did not seem to supply us with all of the information we desire. In regard to the disposal of animal refuse, more particularly waste meat, offal from dead animals, fish, etc., I have been fortunate in seeing established in Cleveland the most modern method I have read about or have seen for effectually disposing of the nuisance from the vapors which are common in all of these rendering establishments, while at the same time producing a large amount of material on a basis of financial return. There is a large fish packing concern at Cleveland, which was time and again in the courts for producing a nuisance through the rendering of fish offal until two years ago, when the court and board of health gave the owners three months' notice to put in some sort of plant to remove the nuisance complained of, or else stop bringing the offal into the city. So effectually did the owners develop their process that a year afterwards the health officer did not know that the company was handling any refuse whatever. I thought at the time it was the best illustration of the possibilities of carrying on the business without creating a nuisance one could have. It is a simple method by which a digester under compressed air has all refuse put in it when it is as fresh as possible. The cooking is done in a tight compartment. They remove by atmospheric pressure all fats after the digestion has been completed, and subsequently take the remaining pressed material and transfer it to revolving cylinders and by means of a partial vacuum process remove the vapors during the drying and condense them with water and discharge them into the river there, and so completely is this done that they profess to take out up to the last half per cent. all of the fats that are present. They can do this economically. Their produce is worth from thirty to forty dollars a ton. If the

material is rich in fat, like fish refuse, they have found it possible and financially profitable to pass gasoline through the pondrelli to finally dissolve out the remainder of the fat, which may not be more than one per cent.

This is the most advanced system I have seen anywhere, and one which Dr. Probst will tell you is being carried on entirely without any evidence of its existence in the neighborhood, so far as unpleasant odor or anything like that is concerned. I would direct the attention of the committee to that, with the hope that it may add to the information which Mr. Hering has given us. It is a notable advance in the method of disposal of refuse, and does away with the creation of nuisances.

DR. HEBER JONES, Memphis, Tennessee.— This subject has interested me very much. I was very glad to hear what Dr. Bryce had to say about the improvement that had been made in the disposal of refuse in Cleveland. I do not agree with everything contained in the report of the Committee, and I think I can convince the Chairman of the Committee that he is wrong on some points. The reports read, so far, have shown the cost of the destruction of garbage by fire. It is a very cleanly method. In 1898, we built our first crematories in Memphis, and I will give you, briefly, the cost of destruction. When we first began to use our crematories, we were not satisfied because the furnaces were not long enough. We have added to them a great deal, so that instead of having furnaces twenty feet in length, we now have a furnace which is about fifty feet long, and which is operated at exactly the same expense — including fuel and labor — at which the short furnace was operated. The result is this: We now destroy garbage in Memphis for 15c per ton. I am giving you the figures for nine months of 1903, up to October 1st, and I know that it will not exceed that amount this year.

As to the destruction of garbage without creating an offence to anyone, and without emitting unwholesome odors, our method has never been objected to. Certainly, we have the only garbage crematories of which I know, that are located in the heart of the city. We have four, two of which are located in the suburbs, where it is not thickly settled, but the other two are located in the densely populated sections of the city, and there has not been a solitary complaint from anyone in regard to these crematories.

As to the various methods of garbage disposal, I am opposed to all methods in vogue, up to the present time, except cremation, and chiefly for these reasons: The cost of the collection of garbage — with the crematories properly located — is less than that of any other method that has been adopted. By locating the crematories centrally, and scattering them so as to make the haul short, the cost of the collection

of garbage is about one-third of the average by any other method. This year, we will collect garbage from 16 square miles of territory for about 62c per ton, delivering it to the crematories at that price. The crematories will destroy it at the rate of 15c per ton. No city in the United States can show anything like as low figures as these. If garbage can be collected and destroyed at these figures, all the refuse of a city can be collected and destroyed by this same method, and at the same, or a less cost.

The essayist mentioned the blast furnace as being an advantage. I dare say it may be an advantage, but we get heat in our furnaces with a stack eighty feet high. We get a blast, with a fifty foot furnace, which will burn everything except metals, and we reach the melting point for these in the afternoon, when our furnaces are at their best.

I would advocate, therefore, the destruction of garbage by cremation as *the* method. I am more or less familiar with all of the other processes for disposing of garbage, and object to them on the ground that they are far less sanitary, and are more expensive, in both small and large cities.

As to the feeding of stock with it, that is the most expensive method one can adopt. If you will take the cost of hauling it a long distance for feeding swine, together with the fact that, even if hauled far beyond the city limits, it is a nuisance and a menace to the health of the people, I think you will agree with me that such methods should be abandoned in favor of cremation, especially when the latter is beyond dispute more sanitary, and vastly less expensive.

MR. HERING (closing the discussion).— In closing the discussion there is not much to say, because no exception has been taken to any of the conclusions reached by the Committee. These conclusions must of necessity be of a general nature. The Committee does not pretend to criticise any particular city or the methods in use by such a city, but takes up the matter from a general standpoint, and especially wishes to point out those guiding points which should enable each city to proceed in the most economical way to obtain the most efficient results.

Dr. Bryce mentioned the system that is in use in Cleveland. That system is covered in the general remarks referring to the reduction of garbage. Of course many more points could have been incorporated in the report, but it might have made it too long for reading to this Association. The original report covered fully a thousand pages. The Committee did a large amount of work. In its late annual reports it has summed up the work. It has repeatedly concluded that if a certain system of reduction in a particular place can be carried out at a less cost to the city or town than any other system, then there is no objection to it. On the other hand, if cremation costs less and does

not make a nuisance, then that is best. One particular method is not suitable for all cities or towns. In connection with the cost of the disposal of refuse, we must take into consideration the cost of transportation from house to dump. If that is left out, we will get an erroneous conclusion. From our experience, we cannot deny the fact that almost every one of the processes mentioned has been successfully adopted in one place or another. Dr. Chapin, of Providence, R. I., is emphatic in his recommendation under certain conditions to feed garbage to swine, to which very often strenuous objection has been made. Many sanitarians are opposed to the reduction system, and others are again opposed to the cremation system, as usually practiced. It is the opinion of the members of the Committee that if the subject is considered as suggested in the report, by taking up each case individually a proper system for each city can be readily selected, which will be both effective and economical.

Dr. Gardner T. Swarts, Providence, R. I., Chairman of the Committee on Disposal of Industrial Wastes, stated that the Committee simply desired to report progress. (See page 166.)

Dr. J. C. Perry, Washington, D. C., read a paper entitled "Maritime Quarantine in the Management of Cholera at Foreign Ports." (See p. 232.)

Mr. Marshall O. Leighton, Montclair, N. J., read the report of the Committee on Purification of Water Supplies. (See p. 91.)

DISCUSSION.

MR. F. H. NEWELL, Chief Engineer of the Reclamation Service, Washington, D. C.— The report read by Mr. Leighton brings out some of the points of interest in connection with a general examination of the character of the water resources of the United States. It is not possible to discuss this matter in the brief time allotted, but attention may be called to some of the larger features of the work referred to by Mr. Leighton.

The United States Geological Survey has for many years been studying the resources of the country and collecting facts which will be of value in the utilization of the wealth lying dormant in soils, minerals and waters. The work has been largely of the nature of field examinations as distinguished from laboratory methods. That is to say, efforts have been concentrated upon the development of methods of investigation applicable in a large way to great extent of country. For example, in topographic mapping the vast extent of the United States has been considered, the amount of money which would probably be available,— and plans have been made for a map which would

ultimately cover the whole United States in a reasonable time and at moderate cost. The resulting methods and control have been widely different from those, perhaps, where the attempt was made merely to utilize certain available funds in mapping along ordinary methods. The same is true of the geological investigations of the Survey. Many geologists would like to spend years upon an area of a few square miles; they must, however, adapt their methods to conditions where large areas are to be examined, and important generalizations deduced for extensive tracts.

In the study of the water resources similar conceptions have entered. It is not practicable to make extensive laboratory investigations of a certain stream at a certain point, but all of the important streams of the country must be considered at all points, and methods devised such as will give general knowledge of the quantity and quality of the water supply of the United States, both above and below ground.

The system for measuring the quantity of water has been brought to a point where satisfactory results are being obtained and made available for the use of engineers, sanitarians, or investors.

The study of the quality of water has just begun, and to Mr. Leighton has been entrusted the problem of developing methods of field examinations of waters, such that tests can be made rapidly, with reasonable accuracy, and results obtained which will have scientific value and a practical application to various problems.

In this work aid has been received in the way of suggestions and friendly criticisms from many of the members of this Association, and I merely wish to express to you my appreciation for the encouragement received from you individually and collectively.

Dr. John W. Ross, U. S. Navy, Washington, D. C., read the Report of the Committee on the Etiology of Yellow Fever. (See p. 39.)

Dr. L. O. Howard, Washington, D. C., read a paper entitled "Concerning the Geographic Distribution of the Yellow Fever Mosquito." (See p. 71.)

Dr. Henry R. Carter, Baltimore, Md., read a paper entitled "Some of the Characteristics of Stegomyia Fasciata Which Affect its Conveyance of Yellow Fever." (See p. 50.)

A paper by Dr. W. C. Gorgas, U. S. Army, Washington, D. C., on "Period of the Disease in Man During Which Yellow Fever can be Transmitted to the Mosquito," was read by title, in the absence of the author. (See p. 65.)

A paper by Dr. Luis E. Ruiz, Mexico, Mexico, was also read by title. The title of the paper was "Mosquitoes in Mexico City." (See p. 77.)

Dr. Carlos J. Finlay, Havana, Cuba, read a paper entitled "New Aspects of Yellow Fever Etiology Arising From the Experimental Findings of the Last Three Years." (See p. 68.)

Dr. J. M. Lindsley, Havana, Cuba, read a paper entitled "Quarantine Regulations Should be Based Against Yellow Fever upon the Doctrine that it is Conveyed only by the Mosquito." (See p. 81.)

Dr. John Guiteras, Havana, Cuba, made a few comments corroborating the statements made in the report of the Committee as to the transmission of yellow fever. (See page 47.)

DISCUSSION OF THE SYMPOSIUM ON YELLOW FEVER.

DR. QUITMAN KOHNKE, New Orleans, La.—It is admitted that railway cars can carry mosquitoes, and presumably do carry *Stegomyiae;* but *Stegomyiae* are fewer in number than other mosquitoes, and the fact that the *Stegomyia* was not found in certain railway cars is no evidence that it does not travel in this way. In vessels their number is small compared with other mosquitoes, but they are conveyed by vessels, and they are conveyable by railroad cars.

The situation in Texas, I believe, has been described, and the reasons for that situation have been properly given. The mosquito theory that was, and law that is, was not recognized properly or completely in the quarantine regulations of Texas against Mexico, for the reason, probably, that the disinfection, which is effective against mosquitoes, was considered destructive to fabrics and to the interior furnishings of cars. Formaldehyde and pyrethrum powder, I believe, are now used to disinfect railway coaches. Pyrethrum powder will not kill mosquitoes, nor will formaldehyde do so. Sulphur will, and this can be applied to the disinfection of railway coaches without injury to fabrics, and without tarnishing metals. The amount of sulphur burnt in an infected room, according to the United States Public Health and Marine Hospital Service recommendations, is, I understand, four pounds to every thousand cubic feet of space. Experiments undertaken in New Orleans just prior to my departure show that one-fourth of this amount, namely, one pound of sulphur to the thousand cubic feet of space, is sufficient to kill mosquitoes, and it is not sufficient to injure any fabric by decolorization, or to tarnish any metal.

The objection to sulphur fumigation is that the odor clings to fabrics for a long period. We have experimented with ammonia fumes to obviate this. An enclosure was filled with the proper proportion of sulphur fumes, and then ammonia was vaporized in a generator, six ounces for each pound of sulphur being introduced into the enclosure. This produced immediately a white opaque vapor, by the union of ammonia with sulphur, forming the sulphite of ammonia. After five

minutes' admission of air, all odor was gone. The application of ammonia fumes following sulphur disinfection will render a car, in our opinion, habitable immediately after disinfection, and no longer period than an hour and a half (probably much less) will be required to properly disinfect a sleeping coach for suspected yellow fever. I believe that quarantine regulations by land should be as effective, as reasonable, as scientific, and as complete as maritime quarantine, and I speak as a Louisianian desiring to be protected from Mexico through Texas.

DR. CH. WARDELL STILES, Washington, D. C.—I should like to mention two points, one of a practical, the other of a scientific nature, in connection with the symposium on yellow fever.

Referring to fumigation with sulphur, I would suggest that persons who object to this method might try the method of disinfecting against insects by the use of hydrocyanic acid gas, as recently described by L. O. Howard (1902) in Circular 46, Division of Entomology, U. S. Dept., Agriculture.

From a scientific point of view Dr. Finlay's paper has brought up some very interesting propositions, which must necessarily demand a great deal of attention, not only because of the charming personality of the man who presents them, but because of his great scientific ability. At the same time, I must confess the paper gave me a biologic shock. It is a general proposition that we have two methods of reproduction among animals, one the non-sexual, the other the sexual, reproduction. In the non-sexual reproduction, we have reproduction by geometric ratio, as 10; 100; 1,000; 10,000; 100,000; 1,000,000; etc. In the sexual reproduction we have a much less rapid reproduction since a number of the members of each generation are males.

In yellow fever we have a disease with a short period of incubation, which points to a very rapid reproduction of the parasite which causes it. The sexual reproduction would necessarily be so slow that it is difficult to conceive how we could have so many parasites of so minute a form developing in numbers sufficient to overcome the human body in such a short period of time. Just think of the difference! In the seventh generation of a parasite by the sexual method of reproduction, we might have only about 15,000 individuals for every one introduced; by the non-sexual method, in the seventh generation we might have about 1,000,000 parasites. The human body is a large body to overcome. We would therefore naturally assume that the rapid method of reproduction, the non-sexual, would be the first we would naturally take into consideration in connection with yellow fever. Take any of the protozoa, where we have rapid reproduction, it is by the non-sexual method; in the insects, where we have rapid reproduction, it is by the parthenogenetic reproduction (i. e. without addition of males).

When we consider the interesting idea which Dr. Finlay has brought before us, I think it runs against a rather difficult biologic problem; and I hope he will consider this problem and give us some explanation of how he can get around it; otherwise we will have to be a little conservative in accepting his view at present.

DR. CARLOS J. FINLAY, Havana, Cuba.—I am surprised that Dr. Stiles should make a calculation of the number of parasites in connection with the transmission of yellow fever. The position taken by me is this: It is not after the spores have been given off or are produced that the greatest danger from yellow fever occurs, but the danger is from the production of toxins that have been already produced through the sexual act, the process of reproduction, or fecundation. The formation of toxins in the system helps to give out sporites. After toxins have been introduced into the system, and an attack of yellow fever follows, then yellow fever is to my mind a toxic disease. Let us take tetanus, for instance, a disease in which the infection is caused in a similar manner to that of yellow fever. I do not see how the number of parasites has anything to do with that disease. In a case of tetanus the number of bacilli is small. I do not think there is any connection between an attack of yellow fever and the number of germs produced in the body.

DR. ARTHUR NOLTE, New Orleans, La.—I wish merely to call the attention of the author of the paper on quarantine based on "the *Stegomyia* theory" to the fact that he is in error in regard to doing away with detention. That has nothing to do with the mosquito. The period of detention of five days from the last exposure will have to be carried out; whether a vessel is one day or five days in transit, it makes very little difference, as a vessel is merely a moving house, and if that house is infected with mosquitoes (that is, *has infected mosquitoes*) the mosquitoes can bite at any time, and even at the port of arrival. Quite a number of vessels have carried passengers from Rio Janiero, being thirty days on the trip, and yet yellow fever broke out at Louisiana quarantine station.

I wish to call attention also to the methods of handling yellow fever in Southwestern Texas, and to say that Dr. Guiteras is in error. I was not in Laredo myself when the fever broke out there, but the methods of preventing its propagation were based upon the mosquito theory. Other things besides were done. The methods of prevention of the spread of the disease were in charge of the Marine Hospital Service people, who did their best. They surely teach and practice the doctrine that through the *"Stegomyia fasciata"* is the sole method of propagating yellow fever.

As to San Antonio, I was in that city myself about three weeks before yellow fever was announced. I arrived there the day yellow fever was announced in Laredo. The health authorities put on rigid quarantine, and took precaution at once to provide themselves with mosquito bars, etc., and to carry out the methods of isolation of patients and destruction of mosquitoes, should they have any yellow fever, thoroughly. The local health officials were willing to receive instructions from Major Mason of the United States Army, stationed there, and myself, and I think all of the modern methods were carried out. I remained in San Antonio eight or nine days, and I do not think there was any case then known, but as I told them, there were probably a few cases of which nobody knew, and if so, they would know it after the period of "outside incubation" (as mentioned by the doctor), that is, about two or three weeks.

DR. JOSEPH Y. PORTER, Key West, Florida.—It occurs to me that the practical application of the mosquito theory or the mosquito law, as now understood and accepted, and as stated by my friend, Dr. Kohnke, has only this essential bearing upon the management of maritime quarantine; it does away with disinfection of fomites or what has been supposed to be fomites, as we do not now recognize fomites in yellow fever. I do not understand that it has any influence over the detention of vessels coming from yellow fever infected ports which have not been fumigated prior to their leaving said ports.

Dr. Nolte has anticipated me a little, as I was to remark that a vessel is a "moving house." If mosquitoes on board have not been destroyed at the port of departure, and there are non-immune persons on board, the vessel must be fumigated and detained at quarantine to kill any infected mosquitoes, provided she has been less than five days from the port of departure. That, I think, is the sum and substance of the application of the mosquito law to the management of quarantine on our coasts, and that is the application I have tried to make in my management under your directions (referring to the President) at the ports of Florida during the past summer. It is said that only a woman is allowed to change her mind, and it has been hinted that I am not consistent. I was not convinced, when the Pan-American Medical Congress was held in Havana, some three years ago, that the mosquito was the only and sole means of transmitting yellow fever to the human being, but stated then that I was ready to be convinced; I wanted the proof, and I have had the proof given to me since. I am ready to accept the law, and I wish to commend the efforts and action of the sanitary authorities of Havana in all of the work they have done during the past year previous. I have been in close touch with them during the past summer, and I can personally testify that

there is no doubt in my mind that the mosquito is the only means of transmitting yellow fever to the human. (Applause).

DR. HENRY R. CARTER, Baltimore, Md.—Like Dr. Porter, I must take up my testimony against the doctrine that the acceptance of the theory of the mosquito conveyance of yellow fever changes *all* of our quarantine practice—maritime quarantine, I mean. Like him, almost the only change I would make in my maritime work is that I would not disinfect fomites—bedding, baggage, freight, etc. There is the same need of providing against men in the active or incubative stage of yellow fever, as there ever was. The risk conveyed by such men, unless provided against, whether by isolation at quarantine station or elsewhere, is as great as ever.

My creed Dr. Lindsley has read: I believe the mosquito is the only conveyor of yellow fever to man, and am perfectly willing—nay, desirous—of basing all measures against it on that doctrine; but I do *not* agree that this involves, or allows, the radical changes in our maritime quarantine which have been outlined. Surely Dr. Finlay believes this doctrine, and it is reasonable to believe that his maritime quarantine at Havana is based on it; yet it is by no means such a quarantine as Dr. Lindsley has described. Vessels and passengers from yellow fever ports are treated at the Havana station very nearly in the same way as at United States quarantine stations. The vessel is either disinfected or kept away from the wharves, and the non-immune passengers are detained five days in quarantine dating *from the time they leave the vessel.* When the vessel has taken the precaution at the infected port of lying too far from shore to allow of the conveyance aboard of *Stegomyiae,* the vessel is not disinfected at Havana, and the quarantine of the passengers dates from leaving the infected port. This is a logical quarantine, (from the mosquito doctrine,) but not such a one as Dr. Lindsley has described.

Reed indeed said that vessels which had been out twenty days without infection needed no disinfection, but he wrote me afterwards stating that he was in error in saying that.

I also think it "consistent and reasonable" to draw a geographical line in yellow fever maritime quarantine,—between places where *Stegomyiae* are present and places where they are not. In the latter yellow fever is not an infectious disease, and may be admitted without limit and with no precautions, and there will be no spread. We know only too well that this is not true in our Southern ports. This line, so decried, is intended to mark the northern limit of coast habitually harboring the *Stegomyia fasciata,* and it is eminently logical and altogether consistent with the mosquito theory, to recognize such a line.

Moreover, I believe the line hitherto recognized is rightly, or very nearly rightly, placed.

DR. JAMES CARROLL, Washington, D. C.—There is one point in connection with the spread of yellow fever that has not been brought out. I was informed on good authority that a number of cases of yellow fever had escaped observation. It brings out the necessity for strict regulations requiring vessels under penalty, where yellow fever is suspected to be present, to report to the authorities at once all cases of yellow fever of any kind coming under their control. These cases should be inspected by men of experience or experts, and they should be treated as cases of yellow fever until they are proven beyond a doubt that they are cases of fever of another nature; at the same time, unless measures are instituted, the disease cannot be stamped out with absolute certainty, because some cases of yellow fever are so mild that they escape recognition unless the disease is known to be prevailing, and men who have not had considerable experience are liable to err. The only way to overcome the possibility of mistakes, such as those arising on vessels, is to report every case, no matter what its nature, to the authorities, in order to be properly inspected and taken care of.

DR. J. M. LINDSLEY, Havana, Cuba.— I want to make a practical illustration between the different southern ports and Havana. We have the Ward Line steamer which runs out of New York to Havana into Mexican ports, back to Havana, and into New York. It has carried yellow fever patients this summer and last summer. That steamer is not held in Havana during its voyage; but there are certain regulations governing it. No ship should be held when you know positively that it is not infected, whenever the *Stegomyia* is killed on that ship. If the South should change its regulations, it must be prepared in letting vessels go through southern ports and not detain them five days in cases of infection. Let Florida and Mississippi, give us scientific quarantine, and Texas, Louisiana and Alabama will follow. Last year, when I started to agitate this question as an educational feature, the state boards of health (known as the Galveston Conference) had quarantined against Cuba, when we had not had a case of yellow fever in two years. Surgeon-General Wyman took quarantine off, so far as the states of Florida and Mississippi were concerned, and the other states could not hold out with these two states open.

A vessel is never infected unless there is one condition, namely, that it has an infective *Stegomyia fasciata* on board. A vessel went from Texas to Mexico into Cuba, came back up to New Orleans, and was 26 days out; not a single case of yellow fever developed on that ship, yet the vessel was held five days on arrival at New Orleans.

We want quarantine regulations for protection of the public. We must not hinder commerce unless it is absolutely necessary.

DR. JOSEPH Y. PORTER, Key West, Florida.— I would like to ask Dr. Lindsley a question, how he would treat a vessel under these conditions: Let us suppose that a vessel has come from Tampico to Pensacola with a non-immune crew, probably infected with *Stegomyia fasciata* at Tampico, the vessel not efficiently fumigated before leaving Tampico on account of conditions over which the health officers at Tampico had no control, and that vessel arrives at Pensacola — suppose he takes off every man of that crew at the quarantine station, what becomes of the vessel? Would he find any captain who would surrender his vessel, to be taken across the bay at the will and pleasure of the consignees? He talks about taking off people and detaining them at quarantine, and letting the vessel go. I agree with the Doctor that it is possible to do this, but what would become of the vessel in the mean time? No captain would surrender his vessel; so the detention will have to be until the vessel is determined to be safe by the quarantine officer at the point of arrival to go to Pensacola or to other ports in the State of Florida.

Practical and rational measures must prevail in quarantine management. To theorize is one thing, but "the man behind the gun," the "fighter" and the man responsible to the people deals with practical and practicable measures,— not theories.

DR. J. M. LINDSLEY, Havana, Cuba.— I will give an illustration of what occurred in Mobile. A steamship came into Mobile bay. It had a yellow fever case on board. How the man became infected I was unable to find out. I have written to the proper authorities, but thus far have not received any reply. What was the condition? They left enough men on board to carry the ship to the wharf. They took the man sick with yellow fever and placed him in quarantine, disinfecting the quarters he had occupied. Then they allowed the vessel to unload its cargo of fruit, because it could not be detained for five days without destroying cargo. They killed all *Stegomyia fasciata,* but even had they not done so the vessel would not have been infected, because it would have taken twelve days before the *Stegomyia* could become infective. What became of that steamship? After unloading they sent it to the quarantine station at Mobile; took on the sick man; carried him over to Ship Island, removed him again from the ship, and he died from yellow fever, after which the vessel was disinfected and held five days. The steamer was not infected with yellow fever. Therefore it was unnecessary to re-disinfect, send it to Ship Island and hold it five days at a tremendous loss to the steamship line.

As far as the crew is concerned, my remarks had reference to passengers. We want the South open for passengers. The crew of a vessel can be handled in one of two ways. Every captain of a steamship should be a part of the quarantine service. Let him give bond to keep the crew on the vessel while it is in port. Let the quarantine officer take the temperature of the crew every twenty-four hours, which will absolutely prevent yellow fever from coming into the United States.

DR. ARTHUR NOLTE, New Orleans, La.— I want to say this, after listening to the remarks of Dr. Lindsley, that we know how best to carry out the quarantine regulations in the southern ports, and those methods are so well known that it is unnecessary and it would take too much time to go into details now. We do not want to interfere with commerce at all; we strive to guard against that at all times.

DR. WILLIAM BAILEY, Louisville, Ky.— I want to speak of a little bit of early history, and to say how much I am pleased with the mosquito theory to enable me to account for some of the difficulties that presented themselves at that time. Going back to the history of 1878, I lived in one of the few cities in the country where public sentiment had been created that yellow fever was not a contagious disease. In that city we opened our doors and received ten thousand refugees from the South. We built a yellow fever hospital; we treated hundreds of these refugees with yellow fever, everybody in connection with this yellow fever hospital being non-immune, and we made every examination that intelligent observation could do. We had ten or a dozen post-mortem examinations which were closely studied, sections having been made and examined by the microscope, by chemical analysis, etc. Everything was done to determine the character of the disease. With this number of cases, and we physicians who had never seen a single case of yellow fever before, there was not a single case developed in that city from that hospital.

Another circumstance came up that gave me great difficulty, and that was separate and distinct from this hospital, and immediately surrounding the L. and N. depot (I refer to the city of Louisville), within one block, we had twenty or thirty of our own people who had yellow fever and who were sent to the hospital. Some of them died under the same circumstances and with the same symptoms as those who had come from the South. Now, I am happy to say that there was no danger to us from contact with yellow fever patients brought to Louisville; but it is my conviction that the *Stegomyia fasciata* was brought there in the car, acted upon, and infected the twenty or thirty cases we had among our people.

In the same year we had a vessel (The John D. Porter) coming up the Ohio above Cincinnati with a case of yellow fever on board, and

yet no person in Ohio contracted the disease except those who visited and were on this vessel, where the patient was subjected to the bite of the mosquito. I think the whole history now is confirmatory of and the difficulties explained by the mosquito doctrine which we have heard.

On motion, the Association adjourned until Thursday, at 10 A. M.

THURSDAY, OCTOBER 29, 1903 — THIRD DAY —

MORNING SESSION.

The Association met at 10 A. M., and was called to order by the President.

The first order was the report of the Executive Committee by the Secretary.

THE SECRETARY.— The Executive Committee considered the resolution offered by Dr. Lindsley in regard to the transmission of yellow fever by the mosquito, and reports that it is deemed inexpedient to adopt such a resolution at this time.

The resolution is as follows:

WHEREAS, it is an universally accepted fact by scientists that the only known natural way by which yellow fever is transmitted is by the mosquito, known as the *Stegomyia fasciata;* therefore, be it

RESOLVED, By this Association that all quarantine regulations shall be based thereon.

RESOLVED, That a special committee shall be added to the committees now in existence to be known as the Quarantine Committee.

THE PRESIDENT.—You have heard the report of the Executive Committee. Are there any remarks?

DR. J. M. LINDSLEY, Havana, Cuba.—I would like to make a few remarks on that resolution. Gentlemen, we have been for three or four years trying to get resolutions passed by different bodies on the question of yellow fever, as to whether quarantine regulations should be based on the mosquito and that alone. They tell us that we must educate the people. This Association was organized to educate the people thirty-one years ago, and it came into existence for that very purpose. It was not satisfied with educating the people of the United States, but it took into its fold the people of Canada, the people of Mexico, and last year they received into this organization the little Republic of Cuba.

Dr. Guiteras, who spoke so admirably yesterday afternoon, has been for the last one or two years trying to get the health authorities to adopt the same plan adopted in Havana, by which yellow fever has been absolutely kept out of Cuba for three years. These resolutions

were killed at the Pan-American Medical Congress, held in Havana, by the Public Health and Marine Hospital Service. If these resolutions are correct, we want to have them adopted. We have in the chair to-day the President or Surgeon-General of the Public Health and Marine Hospital Service, and we do not see any reason why these resolutions should be killed by the Executive Committee. I appeal to this body to adopt them, and if it does not, then epidemics occur in the South because our people are not educated along this line, as they should be by the Public Health and Marine Hospital Service, and this Association.

At the conclusion of Dr. Lindsley's remarks, it was moved that the report of the Executive Committee be adopted. Seconded and carried.

The report of the Treasurer was then presented by Dr. Frank W. Wright, New Haven, Conn., as follows:

FRANK W. WRIGHT, TREASURER IN ACCOUNT WITH THE AMERICAN PUBLIC HEALTH ASSOCIATION.

RECEIPTS.

To Cash on hand at last meeting		$579 59
To Cash from dues of members for 1900		20 00
To Cash from dues of members for 1901		95 00
To Cash from dues of members for 1902		1,825 00
To Cash from dues of members for 1903		15 00
To Cash for sale of transactions, etc		268 63
		$2,803 22

EXPENDITURES.

1902.		
Dec., 20.	By cash paid C. O. Probst (Order No. 137)	$110 00
27.	By cash paid G. C. Whipple (Order No. 138)	23 15
27.	By cash paid H. D. Pease (Order No. 139)	29 64
27.	By cash paid F. W. Wright (Order No. 140)	141 50
1903.		
Feb., 19.	By cash paid Wm. Whitford (Order No. 141)	210 51
May, 23.	By cash paid J. Nolty, Mngr. (Order No. 142)	27 50
Aug., 13.	By cash paid Berlin Ptg. Co. (Order No. 143)	1,237 00
13.	By cash paid J. E. Bauman (Order No. 144)	10 00
27.	By cash paid C. O. Probst (Order No. 145)	251 00
Oct., 19.	By cash paid C. O. Probst (Order No. 146)	50 00
19.	By cash paid U. S. Express Co. (Order No. 147)	3 49
19.	By cash paid F. W. Wright (Order No. 148)	28 86
19.	By cash paid Berlin Ptg. Co. (Order No. 149)	57 00
Oct., 24.	By cash on hand	623 57
		$2,803 22

WASHINGTON D. C., October 29, 1903.

The auditing committee has examined the books and vouchers and report of the treasurer and find them correct. We beg leave to express our commendation of the system of accounts and accuracy with which they are kept.

Signed. GRANVILLE P. CONN,
WM. BAILEY,
J. N. HURTY,
Committee.

THE PRESIDENT.—You have heard the report of the Treasurer. What disposition will you make of it?

DR. FRANKLIN C. ROBINSON, Brunswick, Maine.—I move that the report be accepted and referred to an auditing committee. Seconded and carried.

THE PRESIDENT.—The chair will appoint on that committee Drs. G. P. Conn, Wm. Bailey, and J. N. Hurty.

Dr. Benjamin Lee, Philadelphia, Pa., read the report of the Committee on Teaching Hygiene and Granting Diploma of Doctor of Public Health. (See p. 124.)

DISCUSSION.

DR. T. A. STARKEY, Montreal, Canada.—Mr. President: Unfortunately, there was some misunderstanding which prevented me from taking part in the deliberations of this committee. I say it is unfortunate, because otherwise the report would have been quite different. You have heard the different points brought out in this report, the want of many things in the curricula. We deal with both sections, both public school sections and medical sections. In the public school section we instruct teachers at what we call the normal schools, those places where teachers are prepared before they go out to various schools. They are taught and have to go through a compulsory course of hygiene, and it fits them for the instruction of children afterwards. We are endeavoring just now to institute an examination for these teachers, to bring them up to a good standard so that they shall have a certificate, and we hope the governmental and municipal authorities will select those teachers in preference to those who do not hold such certificates. Surely that will come about.

As regards the medical side, we have, first, under-graduates, and, second, post-graduates. The under-graduates at McGill are forced to go through a course of hygiene. This course is directed to a general knowledge of sanitation, so that they will be able to take up ordinary sanitary matters, especially with regard to infectious diseases, and advising families and the like of that as regards sanitation. We do not say that they are equal to taking up the course of medical officers of health; that we deal with in the post-graduate course. The post-graduate course is the most important of all, because it is our object to turn out men who are thoroughly fitted and equipped to deal with all sides of sanitation. You all know that the medical officer of health is a most important man, and it is apparent that the municipality, township, or district always looks to the medical officer for advice in the first instance. The people have no experts around them to call in, and

ask questions on this subject, but they consult the medical officer of health. We turn out men who are able to advise these people, and then if there is any difficulty they can call in an expert. Our men, you must remember, are qualified men first of all. No man can go in for the court unless he is qualified. After that he has to go through a certain course of instruction which takes him about a year. He has to be smart to master the course in less than a year. As we are going now, it will take eighteen months instead of a year to master the course. First of all, we give instruction in bacteriology, which is given in the bacteriological department. We give students a very good grounding, and we turn out men who, we think, are quite capable of making any bacteriological analyses that they may be called upon to do. Of course, even experts on bacteriology meet with instances where they fall and cannot get any farther. These men, we presume, will suffer from the same disadvantage.

We teach them chemistry; that is we take them through ordinary analyses, so that they are capable of making analyses of foods, water, or anything else like that. They have six months' training in general sanitation, that is, in epidemic diseases, and general sanitation from a municipal point of view, taking in water supplies, sewage, etc. Then they are thoroughly instructed in sanitary law, more especially with reference to the districts in which they live. I assure you that all of these various subjects are so thoroughly taught, that in their examinations you will find that the men are very fair lawyers. You will find that they are thoroughly at home with the various points of law, and are able to advise a municipality in various prosecutions, etc. That is very important, because you will find that where we have a man who knows nothing about the law of the district in which he lives, it will cause considerable difficulty. Few of us take ordinary pains to know the law in regard to various sanitary matters, and I think municipalities have found out by experience that it is much better to have men who are thoroughly acquainted with the law, so as to advise them in regard to prosecutions, etc. I have no doubt that many small cities or towns have lost their cases because of the ignorance of the medical practitioner about law. If a man is engaged as health officer or sanitarian, who knows the law, he may save thousands of dollars which would otherwise be spent in not employing good men. I think as experience increases, municipalities will come more and more to that conclusion.

General George M. Sternberg, Washington, D. C.— Mr. President: I have been much interested in this report and in the subject upon which it treats. I think the report did not dwell sufficiently upon the importance of teaching hygiene, with the broadest meaning of that

term, in the higher schools and colleges. There should be a professor of hygiene in our leading institutions where advanced students are taught. I would say, that we have been trying for years to have a professor of hygiene at West Point, and thus far we have utterly failed. The plea of the superintendent and of the other instructors there is that there are so many things in the curriculum that they have no room for it. Here are young men to go out as officers of the army, to be responsible for the health of the troops, who have no special instruction in hygiene. One of the gentlemen (I think Dr. Perry) referred to that point.

With reference to the degree of Doctor of Public Health, it is high time that men who are willing to devote their time to acquiring the necessary knowledge should be given such a degree, and we should try to educate the public to demand that their health officers should be specially trained men, and after a time to demand that they should have this degree.

We have made a commencement in Washington. We have been anxious, some of us, to know what this Committee would report, and to consider the question with them, and we can no doubt obtain the necessary legislation to enable the school which has been organized here to give the degree to men who are properly qualified. I hope to hear something of what the Committee regards as the proper qualifications. At the present time we are somewhat discouraged. We organized a year ago with special reference to giving men all the facilities which Washington affords for obtaining instruction in all the branches relating to preventive medicine. For the faculty, we had the President of this Association (Surgeon-General Wyman), who had agreed to give instruction in those matters with which he is so familiar — quarantine matters, and all the legal questions connected with this subject. We were to have the benefit of the special knowledge of Professor Wiley, of the Agricultural Department, who has given special attention to all questions relating to foods and adulteration of foods; of Dr. Stiles, of the Agricultural Department, but now of the Public Health and Marine Hospital Service, who is a recognized expert in everything relating to animal parasites injurious to man; and I was to have given illustrated lectures and laboratory instruction with reference to infectious diseases and their prevention. We were to have the assistance of Dr. Rosenau, of the Marine Hospital Service, who has given great attention to bacteriology and disinfection. We were to have men belonging to the army and navy medical schools among the members of the faculty. We were to have access to the laboratories of the Columbian and Georgetown Medical Schools, also to those of the Army Medical School, the Navy Medical School, the

Marine Hospital Laboratory, which is being established, and we believe that if proper men had responded to the announcement we made, we could have had last winter a fine class, to which we could have given exceptional opportunities. We required that they should be graduates in medicine. We had made an announcement in the various medical journals, and circulated our circulars extensively, and not one man has applied for that course of instruction. Unless the gentlemen here, who are connected with the public health service of states and municipalities, can send us some men who desire to take such special courses, our efforts will amount to nothing. We have not yet perfected arrangements for conferring the degree of Doctor of Public Health, but that matter can be easily arranged if we get students who desire to avail themselves of such facilities as we have in Washington.

DR. JOHN N. HURTY, Indianapolis, Indiana.— Whenever this subject of conferring the degree of Doctor of Hygiene or of Public Health is brought up, my mind is forced to revert to the conditions in my own State— Indiana. Purdue University, which is the industrial school of the State, has a department of hygiene. The management has not yet decided upon conferring the degree. Seven years ago a very competent man was put at the head, Professor Burrage, who was secured from the Massachusetts Institute of Technology, so that we now have the opportunity of teaching hygiene. The management of that University has full power to confer the degree, and will confer the degree if they can get encouragement of some kind. We have a clause in our health law that all health officers, who are not already qualified in hygiene, shall qualify themselves according to the rules of the state board of health. It looks as though the state board of Health has the power to prescribe qualifications right away and fix what the officers shall be. While we have that power legally, if it were exercised, would it work? I think not. A department of hygiene in the University was established. It has now seven men taking the course; but they are taking it in conjunction with general engineering, and the question they ask is this: How can I earn my living by it? They find that the office of health officer is a political one; that the salary is small, and the office can only be filled as a side issue in the practice of medicine, and for no other reason and in no other way, and that discourages them at once. They have been told about the importance of hygiene and that health is the first requisite of happiness and wealth. But again they say, How can I earn my living at it? The teacher of hygiene himself has a very meagre salary; he is enthusiastic though and clings to it. The office of health officer is a precarious one; four years for county officers, and two years for city

officers, and the pay is not adequate for the study. It seems to me until we have in our State (I cannot speak for others) a law requiring that the health officer of the county shall be as important a man as the sheriff, and entitled to proper salary, and give perhaps his whole time to the work, we have little hope of having men enter the department of hygiene with a view to securing the degree of Doctor of Public Health. We can summon the health officers of the State at any time; we have six hundred of them; we have city and county officers, as well as town officers. When these gentlemen come together, we are confronted with the situation that a great many of them have never had the slightest instruction in hygiene, and if we have such ignorance to contend with among these officers, what are we to do? Before we can make progress, there must be a long period of instruction to bring the people up to a knowledge of the situation, and when such a sentiment is created, they will realize the importance of hygiene and of having departments of hygiene attached to medical schools and universities. As it is now, the people do not hesitate to pay millions for cure, but almost nothing for prevention. If there is a living salary attached to such a position, and it is one of power, a position requiring of the applicant who is to fill the office that he must have a degree, there will be some dignity connected with it, but until that time comes I do not see how we are going to push the matter. I sincerely hope that the outlook will soon be very much brighter than it has been.

DR. CHARLES O. PROBST, Columbus, Ohio.— I was particularly interested in the remarks of General Sternberg in the discussion of this subject, as we have had a similar experience in Ohio. The committee recommends that colleges shall create a course in hygiene and grant a diploma of Doctor of Public Health. You know the old recipe for cooking a hare, "first catch the hare." We succeeded in getting the Ohio State University to create a course in hygiene specially suited to health officers, with the expectation of finally being able to grant a diploma to those who would complete the course which it was expected would be developed. A faculty for a college of hygiene was established. The University sent advertisements extensively throughout the state calling attention to this, and the State Board of Healh sent out notice to all of its health officers pointing out the advantages of such a course. At the date when the course was announced to begin, some nine or ten of us, constituting the faculty, were present, but not a single student, and so the matter was dropped. We must first create a demand for diplomaed health officers and sanitarians.

DR. T. A. STARKEY, Montreal, Canada.—The general trend of the discussion seems to have been in one direction. The municipal authorities must appoint local officers of health in towns say of twenty

thousand people, and also in districts. I do not see Dr. Bryce here, but if he were he could tell you about the new move that is taking place in Canada, where the government will divide districts up into counties and municipal boroughs, each having medical officers of health, duly qualified, and fixing a minimum salary.

DR. GEORGE M. KOBER, Washington, D. C.—I move the adoption of the report of the committee, with the following amendment:

RESOLVED, That this Association approves in the main the recommendations of the Committee on Teaching Hygiene and Granting Diploma of Doctor of Public Health, and recommends that the government of the United States be requested to provide a professorship in hygiene both at the military and naval academies. Seconded.

(The resolution was referred to the Executive Committee.)

DR. S. R. TOWNE, Omaha, Nebraska,—The State of Nebraska, when it incorporates a medical college, requires the teaching of hygiene, and each of our colleges has established a course of two hours a week during the second year, devoted to this subject.

GENERAL GEORGE M. STERNBERG.—I would like to say a word or two more on this subject. It should be understood, if the degree of Doctor of Public Health is given, that more than the ordinary teaching of hygiene should be included in the instruction. The prevention of infectious diseases, and everything relating to that should come in before such a degree should be given, I think.

DR. LEE (closing the discussion).—No one is better aware than myself of the deficiencies of this report. I might say, in explanation, that I was somewhat surprised when I received the announcement that the meeting of the Association would take place at so early a date. I have been so overwhelmed with work in connection with our smallpox epidemic, that I was not able to give this report the attention which the importance of the subject deserves. I am, however, satisfied with the remarks that have been made, inasmuch as they have enabled me to listen to a discussion of extreme interest and one which has been full of information. I had hoped Dr. Wesbrook would be present and present the resolution in this connection, but I have not seen him.

In regard to the suggestions, that we were not ready in this country to establish or grant a degree of Doctor of Public Health, I wish to say that possibly we might take a lesson from the railroad authorities. As a rule, they do not wait for a demand; they establish a road, and that road creates the demand. Furnish the supply in the way of transportation facilities, and the business will spring up, and I believe that the schools should take the initiative in this matter; that

they should furnish facilities, and in time they will find their efforts rewarded somewhat by additional students.

Colonel W. F. Morse, New York, offered the following resolution, which was referred to the Executive Committee:

RESOLVED, That this Association, through its Committee on Disposal of Waste, request all companies and individuals having now in operation methods, processes, plants, and working apparatus, for the disposal or treatment of all classes of municipal waste, garbage, ashes, refuse, street sweepings, to submit a concise report of their various methods and plants to this Association. This report to be made by some competent engineering authority, who is not connected with the methods, processes or plants under consideration.

Dr. George M. Kober, Washington, D. C., Chairman, presented the report of the Committee on the Canteen in Armies. (See p. 98.)

At the conclusion of the report, the committee recommended the presentation to the Senate and House of Representatives in Congress the following resolutions:

RESOLVED, That this body deplores the action of Congress in curtailing the authorization of the army canteen or post exchange, and in the interests of general and military sanitation recommends its establishment on its former basis at the earliest possible date.

RESOLVED, That this body, in the interest of temperance and humanity, cordially invites the intelligent co-operation of a very large element of good citizens, who have been active in securing legislation against the sales in the military service of alcoholics of any character, in taking successive steps toward the betterment of existing conditions, and thus assist in controlling and largely curtailing an evil which it is powerless to prevent. (These resolutions were referred to the Executive Committee.)

DISCUSSION.

MAJOR LOUIS L. SEAMAN, New York City.—Mr. President: It is certainly hoped that this report, with the resolutions, attached, will be endorsed by the Association. A vast amount of documentary evidence has been collected from army officers by the Secretary of War on the subject of the canteen. It is utterly useless to question the value of this evidence, which is practically all one way, and which has been so ably embodied in this report. The further discussion of it, therefore, is unnecessary. I merely wish to add in support of it, that at the meeting of the Military Surgeons of the United States, recently held at St. Paul, the resolutions which you have heard were adopted. It was my privilege to present a paper there on this subject, which was discussed by a large number of those present, all of whom were military surgeons, who had served in the field with the troops. The paper was followed by the resolutions, which are practically the same as those you have just heard read, and they were unanimously adopted.

It was also my privilege to introduce the same resolutions at a meeting of the American Medical Association about a week afterwards, this Association representing over six thousand of the ablest men in this country and Canada. The resolutions were again adopted without a single dissenting vote. There is a strong public sentiment against the restoration of the canteen, and possibly, as an amendment to the recommendations which this committee has submitted, it might be wise to eliminate the term "light wine" as being on sale in the canteen. I have been in many army canteens and have never yet seen a soldier buy a glass of *wine* in one. Wine is practically a side issue, but the fact of its being on sale makes it objectionable to the public. If Congress would permit the sale of beer, which is the only practical item that is used, the bill for the restoration of the canteen might pass. I certainly take great pleasure in endorsing the report, and hope it will prevail.

DR. JOHN W. ROSS, Washington, D. C.— It may be interesting to the Association for me to give a brief history of our experience with this subject in the navy. I have been connected with the medical corps of the navy for about thirty-three years. I entered the service soon after the "old grog ration" had been abolished in the navy. This grog ration was somewhat analogous to the canteen. It was abolished during the Civil War as a military necessity, and at the time predictions were made, and forebodings were indulged in, as to the result of it. In issuing the grog ration, at a certain hour of the day the tub was brought on deck and the crew marched around it, each one receiving his share of whisky, or brandy, or rum, whatever it might be; consequently they nearly all became very fond of it. Most of you, who have read naval history, must recollect that it was the almost universal rule in old times for sailors when they got ashore to get tight. They could rarely get enough on board ship to make them tight. So both old and young would go on sprees when on shore. Then, when they returned on board, every man who was marked "drunk and disorderly" was quarantined for three months. The predictions made when the grog ration was abolished were apparently in a measure fulfilled. It was predicted that if the men could not get liquor on board, they would whenever they went on liberty ashore, go on worse sprees than before. During my first cruise it was understood whenever a boat went ashore that if the men got a chance some of them would get drunk, and so no man was permitted to leave the boat. An officer was sent in charge to prevent men from jumping the boat. Even then men would sometimes jump the boat, and then the officer would use his arms. On one occasion a man at Rio Janeiro jumped a boat and was killed by the officer in charge for so doing. The officer had a serious time with the Bra-

zilian authorities. He had a long trial for murder. When the liberty parties came aboard ship during my first cruise, those who had not been fortunate enough to get ashore would congregate around the gangway, and treat with more or less disrespect the men who returned sober. Ten years later, during a cruise which I made in the Pacific, conditions had greatly improved. A new class of men had come in, and the old class had gone out from age, disease, etc. Instead of the men not being allowed to go ashore without an officer to guard them, nearly all of them who were in the good conduct class (when they could be spared) were given liberty to go ashore in port at pleasure. These men would go ashore and return on board ship clean and sober. There was very little drunkenness to be seen among them. This condition of affairs has continued, and there has been no impairment, that anybody could see, in the health and efficiency of the men. Of course, other sanitary measures have had much to do with this advance. About sixteen years ago an attempt was made to gratify the men by giving them a moderate amount of beer, and so they were allowed one bottle of beer at dinner each day. This experiment was found not to work well. It was abandoned in 1899, the immediate cause of its abolition being that it led to murder on one of our warships. One man wanted an additional bottle of beer, and ran his bayonet through the master-at-arms who had refused to let him have it. The condition of affairs now in the navy is no grog, no beer, and no ill effects from their absence.

At the New York navy yard, just outside the yard gate, there were formerly some saloons which gave great trouble to the authorities of the yard. They did all they could to have these saloons abolished, but could not do it. The city authorities paid no attention to the matter. But where there's a will there's a way. The naval authorities insisted. With the co-operation of the navy department, so much pressure was brought to bear that the New York Legislature passed a law to the effect that within a certain limit prescribed by the officials of the navy yard no saloon should exist.

Within the last few years we have established a navy yard at Bremerton, State of Washington. In the town around this navy yard a number of low groggeries and dives sprang up. They caused a great deal of trouble, not only with the employes of the yard, but with the crews of ships. The officials of the yard did all they could to get the people of the community to abolish these saloons, but without success. Opposition seemed to increase the evil. Finally, the officers resorted to more radical measures, and secured the co-operation of the Navy Department. The community was given to understand that it would injure their pockets seriously if these saloons were not abolished.

Even that had little effect. The Navy Department stopped sending ships there, and stopped nearly all work at the yard. Then the city council and board of trade took the matter up, and used their combined influence to abolish these saloons. When the congressman from that district would come to the Navy Department, seeking favors or expenditure of money, he would be asked, "What about those saloons at Bremerton?" He would be informed that his requests would not be granted until these saloons, etc., were abolished. I get these details from the Assistant Secretary of the Navy. Finally, the saloons were broken up completely. Then work was resumed and money was alloted for improvements at the Bremerton yard. This has been accomplished within the past twelve months.

I believe that if the War Department and army officers would act thus determinedly, and pursue the same tactics, the saloons and low dives around the army posts could without any further congressional activity be broken up as easily and surely as they have been broken up at Bremerton and the New York navy yard.

The Secretary here announced the appointment of new members of the Advisory Council.

Dr. Conn, on behalf of the Auditing Committee, reported that the committee had examined the books and vouchers of the treasurer, and had found them correct. The committee expressed its commendation of the system of keeping the accounts and the accuracy with which they were kept.

DR. HEBER JONES.— I move that the report of the Auditing Committee be accepted and filed. Seconded and carried.

Mr. William A. King, Chief Statistician of the United States Census Bureau, Washington, D. C., read the report of the Committee on Demography and Statistics in their Sanitary Relation. (See page 201.)

Dr. J. E. Monjaras, Mexico, Mexico, read a paper entitled "Some Indications that may Serve for a Better Utilization of the Results from a Comparison of the Principal Causes of Death in Cities that Employ the International Nomenclature." (See page 205.)

DISCUSSION.

DR. E. J. MARSH, Paterson, N. J.— Mr. President: I did not come prepared to take part in this discussion. However, the subject has interested me for many years, at first in connection with work as a health officer and more recently in connection with life insurance, at which work I am now engaged as a medical officer. I am sure we are all gratified to find the improvement that is going on from year to year in the

matter of procuring accurate vital statistics. This work was begun, and at first carried on, in the large cities, and only in these cities was the registration at all accurate; for in the large cities no burials were permitted without certificates of death from physicians. As to rural districts, it was until very recently impossible to get any vital statistics that were at all accurate. Those for the State of Massachusetts, however, under the supervision of Dr. Abbott, were for very many years most thorough, and the best compiled of any state in the Union. New Jersey was, I believe, the first to require throughout the whole State, in rural districts as well as in cities, a certificate of death before burial, such certificate to be made by the attending physician or the coroner. I am not positive as to the dates, but it is my impression that this was commenced about 25 years ago, and only after the State Board of Health was organized and we had as its executive officer Dr. Ezra M. Hunt, who was zealous and energetic, and with whom I was associated in drawing up the first law that was passed by our State Legislature requiring an accurate registration of vital statistics based on medical certificates, for all districts of the State. Since that time similar laws have been passed in many other States, but each state naturally worked independently, and there was no co-operation with the United States Census authorities. To this census we are obliged to refer for knowledge of the population and its sex and age distribution and other information, and the age groups were too often made on different lines from those used in the State mortality records. The census tables distributed the population according to the voting age, militia age, school age, etc., while the mortality records were drawn up on lines to represent disease and mortality at periods of life most interesting and important for sanitary officers. Owing to this want of correspondence, the value of the different collections of statistics has been limited. Many interesting questions as to the incidence and mortality of certain diseases at different ages, and the rates of mortality, could not be worked out. With the present century, however, there is a disposition for all to co-operate and to adopt a uniform style of blank, and co-ordinate the work done in the state offices, the census bureau and the public health service, and successful work is earnestly to be hoped for by all interested in sanitary progress and the study of vital statistics.

DR. J. N. MCCORMACK, Bowling Green, Ky.— I have long been interested in this subject, and have found, as a matter of fact, that legislation has been had on the subject in almost every State in the Union. The importance to sanitarians and others of an exact knowledge as to movements of population has been so generally understood, that in nearly every State attempts have been made in some way to obtain this information. Unfortunately as in all the other matters relating to med-

ical affairs, there has been a singular lack of uniformity. When a law has been tried and has failed in one State, probably ten years afterwards, a similar one is enacted in another State, with the hope that it may prove successful, and without accurate knowledge of the fact that it has failed repeatedly.

It appears to me, the work done by Mr. King and the Committee in formulating what is intended to be a uniform law to be recommended to all of the States which have not yet obtained satisfactory legislation, is likely to mark a new era in the work in this country. I trust that this is true; and it seems to me the more promising because of the rapid progress which is now being made in the organization of the medical profession throughout the entire country. Attempts are being made to interest the profession not only in this line of work, but the importance of uniformity of methods everywhere, if results are to be satisfactory.

I have spent some time at Mr. King's office since I have been here this time. I have arranged to have him supply me with the literature and the model bill which he has suggested for adoption in the different States, and will present it to the Legislative Committee as I go from State to State. I will be glad, as the representative of the American Medical Association, as I go from State to State, to urge upon them the importance of uniform methods throughout the entire country in the collection of statistics. The trouble we have found in having a uniform constitution and by-laws adopted for the government of State societies is, that whenever a committee is appointed to take charge of the matter it is difficult to make them understand that the model constitution and by-laws have been prepared with great care, and that it is not necessary for their committee to do original research work or get up a system of its own. I apprehend the same difficulties will occur in regard to this matter unless a personal effort is made everywhere to have uniform methods adopted. When we remember that there is no law on our statute books relating to any of these matters that was not put there by medical men, and that if it is imperfect, it is largely the fault of medical men, it seems to me that the time has come for this Association, the American Medical Association, and the organized profession of the country to realize their responsibility and duty in such matters and to keep them before the legislative bodies until practically uniform laws are not only passed but properly enforced.

DR. CHARLES O. PROBST, Columbus, O.—I have taken much interest in this subject because my state has been depicted as one of the "black states" as regards the collection of vital statistics. Our plan, which has been in force for forty years or more, is to have the assessor, who visits homes annually to value property, report to the probate judge of

each county the births and deaths that have occurred in his jurisdiction during the year. I am sure these records are very inaccurate and very imperfect.

I wish to say a few words in this connection in regard to the Pension Office. When a man dies who has been a soldier in the war the cause of his death will often enter into the question of whether death resulted from injuries received in the war, and may enter into the question of the amount of the pension his heirs will receive. The only record in Ohio, and I think this is true for some of the other states, would be the record furnished originally by the assessor. This record would be accepted as proof of the cause of death in the Pension Department at Washington, as I understand it. This might be called to the attention of the pension authorities here as one of the reasons why we should have more accurate records of deaths.

DR. HEBER JONES, Memphis, Tennessee.—I want to get a little information. The gentleman from New Jersey stated, if I understood him correctly, that the law would not permit interment of a body without a certificate of death from the attending physician, or coroner. I want to ask, if that law is enforced in all cases, what is done when there is no attending physician, and no inquest held? In our country, we have trouble because the coroner is not allowed to hold an inquest unless there is some suspicion as to the cause of death—whether it is natural or unnatural. We, of course, have a great many people who die without having had an attending physician, in which cases it is very difficult to find out the cause of death. I want to ask whether there is a provision for that class of cases in your State? Are inquests held in all cases dying without a physician who may sign the death certificate?

DR. E. J. MARSH, Paterson, N. J.—You mean those who have died without having had a physician?

DR. JONES.—Yes.

DR. MARSH.—The old law was that they either had to have a certificate from a physician or from the coroner. Of late years several of our larger counties have adopted a new law. The "county physician" now makes the first examination of everyone who is found dead, and he calls the attention of the coroner to suspicious cases only.

DR. JONES.—That is one of his duties?

DR. MARSH.—That is his official duty in some of the larger counties. Dr. Leal says it is not so in all, but it is so in Passaic County in which I reside, and many others. In these the county physician examines every case of railroad accident or sudden death, and gives a certificate unless he finds some reason to refer it to the coroner for investigation.

DR. SENECA EGBERT, Philadelphia, Pa.—I desire to call attention to one phase of this subject, namely, the reflex influence of this registration. I listened to Mr. King's paper at New Orleans last May with pleasure, and some of the remarks made by Dr. Wilbur on it gave me more interest in the subject than I had had theretofore.

In preparing a paper for our State Medical Society last month, I had occasion to go over the work of the Census Bureau; and became very much interested in the volume on vital statistics. One thing that struck me as particularly important was the fact that the states and cities in the registration area had far better statistics—I don't mean statistics better compiled—but the state of health was better. The typhoid mortality was lower than in the adjoining states. For example, comparing the State of New Jersey and the State of Pennsylvania, the typhoid death rate in these two states is remarkably at variance. Pennsylvania is certainly not in the same class with New Jersey in that respect, I am sorry to say. If we take other diseases, we find that this difference stands out with startling clearness when we put the statistics alongside of each other. It is remarkable, if you will compare the statistics of the various states, to see the reflex action of this care in registration. Where physicians are all interested in reporting causes of deaths accurately, we find that they have evidently far greater interest in the sanitary condition of their districts, and that they try to impress the laity with an appreciation of its importance, so that the state of affairs is different and far better. I hope we shall be able to convert Pennsylvania before long, because we had 9,000 deaths from pneumonia in 1900, when we only had 7,000 from tuberculosis, an excess in the former that should not be.

Here is a copy of the Bulletin of the Chicago Board of Health (exhibiting). I take it for granted that the statistics given therein are approximately accurate, for they have a certain value to me as a teacher of hygiene, in that they enable me to do what Mr. King is asking us to do, namely, to impress upon students the importance of vital registration. This is the report for the week ending October 17th. In it attention is called to the difference between the total of deaths from scarlet fever and diphtheria in the eight years preceding 1894, and in the eight years succeeding it, and it is shown that the reduction in the number of deaths from diphtheria and scarlet fever in the last eight years constructively amounts to almost 20,000. It is admitted that the greater decrease in the mortality from diphtheria is due, of course, to antitoxin treatment; but there has been a constructive saving by the improvement in sanitary methods and conditions of almost 2500 lives, as far as scarlet fever is concerned, and doubtless of many from diphtheria independently of the particular saving due to antitoxin.

Facts like these are telling, and one can lay them before a class and make it appreciate the importance of such statistics. Then, when the individual students go out in the world to practice medicine, they will appreciate the importance of reporting cases properly to the proper authorities.

DR. WILBUR (closing the discussion).—I regret Mr. King is not here to close the discussion on his paper.

In regard to the question asked by Dr. Jones relative to deaths occurring without an attending physician, it may be interesting for you to know the practice under the Michigan law. In such cases the deaths are referred to the health officer, and in an ordinary case it goes no further. The health officers can certify as to the cause of death. If there are suspicious circumstances connected with a case, it is the duty of the registrar to refer the case to the coroner.

It is gratifying at the present time to see the hearty co-operation which exists between the different associations and different offices interested in the improvement of vital statistics. I have here a copy of the circular just issued by the Census Office, copies of which may be obtained on application, in regard to the statistical treatment of causes of death, and I desire to call your attention to the fact that on the first page we have a list of some of the co-operating agencies—the Committee of the American Public Health Association, the Committee of the Conference of State and Provincial Boards of Health of North America, the Committee of the American Medical Association, the Census Office, the Public Health and Marine Hospital Service, etc.

Here is a report recently issued by Dr. Edward M. Hartwell, of Boston, Chairman of the Committee on Uniform Municipal Accounting and Statistics of the National Municipal League, which goes into the misleading character of the rates given in some bulletins and reports on vital statistics. This Committee and the other committees mentioned above should form a close union for they are all working along much the same lines.

I am heartily in sympathy with the recommendations of Dr. Monjaras in regard to the publication of weekly, monthly, quarterly, and annual bulletins or reports. We ought to have these reports as frequently as they can be issued with convenience and regularity, and they ought to be accessible and used by all registration and sanitary offices. It may not be possible for a state to prepare a weekly report of mortality, as this would involve the return of certificates of death to the central office every week. It is hard enough to get them once a month; but I see no reason why a city office of sufficient size should not issue a weekly bulletin, and I think it is desirable that it should also publish a monthly bulletin, because otherwise the mortality statis-

tics cannot be compared for the same periods of time with the monthly bulletins of states. These could be summarized to form a quarterly statement, and, of course, every registration office should prepare an annual report of some sort. The subject of the preparation and forms of statistical tables, which will also include recommendations in regard to the best period for which reports should be made, is now under consideration by the Committee of the Conference of State and Provincial Boards of Health of North America. Present forms have been accumulated from all registration offices in this country, clipped, pasted, and prepared for study by the Census Office, and the committee will make an exhaustive report next year. I trust that any suggestions or recommendations which may occur to members in this connection will be referred to Dr. Irving A. Watson, Chairman of the committee.

In conclusion, I wish to state that the prospect is bright, as Mr. King remarks, for the improvement and extension of satisfactory registration in this country, and chiefly for two reasons: (1) Unity of all of the agencies interested in the extension of accurate registration; (2) the great improvement in the organization of the medical profession, about which Dr. McCormack has told you. These statistics come from physicians, and naturally, when physicians are organized, they will more fully appreciate the importance of having accurate vital statistics, and, I believe, will do all they can to furnish us with reliable information.

I am glad the gentlemen from Pennsylvania and Ohio spoke of the condition of affairs in their states. These states seem to be great stumbling-blocks. They have every requisite for satisfactory registration; their populations are dense; communication is easy, and there is no good reason why they should not have accurate vital statistics. If we could get these states into line and put their systems on a substantial basis, we would be encouraged in our work for the rest of the country, so that in twenty-five years or less we might expect the country to have as accurate a system of registration as has existed in our new colonies, the Philippines, for many years past.

On motion, the Association then adjourned until 3 P. M.

THIRD DAY — AFTERNOON SESSION.

The Association reassembled at 3 P. M., and was called to order by the President.

The Secretary read a communication from Dr. Smith, Porto Rico, regretting his inability to be present; also letters from Mr. Henry Lomb and the Secretary of the American Anti-Saloon League.

THE SECRETARY.—I wish to make a statement for the Program Committee in regard to this afternoon's program, which is the Wednesday afternoon program substituted for Thursday. The Program Committee had received indirect information that Dr. Doty, Chairman of the Plague Committee, would have a report to present to this meeting. Dr. Doty is here, but informs us that he did not expect to present a report at this time, and wishes to have the announcement made that he has no report to offer.

Dr. Gonzales Fabela, Mexico, Mexico, read a paper entitled, "Something About the Bacteriology and Clinical Features of Plague." (See p. 255.)

DISCUSSION.

DR. JOHN F. ANDERSON, Public Health and Marine Hospital Service, Washington, D. C.—Mr. President: It might be interesting in connection with this paper to allude to the recent work in regard to the plague done in Hong Kong by Hunter and Simpson, with regard to its bearing upon maritime quarantine. These gentlemen have worked among the Chinese in districts in which the plague has prevailed, and they found that those animals which the Chinese liked particularly were capable of conveying the plague bacillus. They found the bacillus in ducks, geese, pigeons, and in one case a portion of a hog exposed for sale in the Chinese market. They also observed that these animals, especially the hog, might suffer from a chronic form of plague, lasting in some cases three or four weeks, and with no other symptoms than a temperature of 103° to 105°. They called special attention to this fact, and as it is a well-known fact that certain vessels engaged in passenger trade in the East carry with them a large number of animals, such as hogs, cattle, chickens, etc., these animals may be suffering from plague, not used on the voyage, but taken ashore, and in that way they may establish a focus of infection. I think this is particularly important as regards maritime quarantine. These observations were anticipated over three years ago by the Public Health and Marine Hospital Service issuing quarantine regulations prohibiting the bringing of animals, such as parrots, monkeys, etc., from any port in which plague was prevailing into the United States.

DR. H. W. HILL, Boston, Mass.—I would like to know how common convulsions are in cases of plague.

DR. ANDERSON.—I was at Liverpool and at Glasgow when the plague wa sprevailing there, and there were some seventy or eighty cases, and from beginning to end I do not remember seeing a convulsion in any case.

Dr. Perry has had quite an experience with plague in the Philippines, and I am sure the Association would be glad to hear from him.

Speaking of this subject, I wish to allude to one point brought out by the essayist, that it is possible to diagnose plague without bacteriological aid. That is true. The plague presents characteristic symptoms and after a person has seen a few cases of this disease, he can very readily make the diagnosis. I have examined a good many Chinese from ports in which the disease prevailed in epidemic form, and I have detected it without much trouble. The diagnosis was verified by bacteriological examination and by death of the patients.

Regarding bubo as a symptom, it is present in the majority of cases, but I doubt if bubo is present before the patient has some fever. It commences in from twenty-four to thirty-six hours. The bubo usually appears in the inguinal region about the saphenous opening; next most frequently in the axilla, and less frequently in the cervical region.

Regarding the symptomatology, especially as relates to delirium and convulsions, I have not seen convulsions as a prominent symptom. The patient is sometimes delirious; more often he passes into an apathetic state; he lies there without paying much attention to his surroundings, and sometimes he has delirium.

Regarding the work that has recently been done by English observers in Hong Kong, it is of great importance because it adds another link to the chain which may explain something that will account for a certain number of cases that have been difficult of explanation heretofore. That, of course, must be considered as an etiological factor. Most of these ships take animals for slaughtering purposes, and it is possible that plague on board ship may be contracted from this source as well as from infected rats. I am a firm believer in infected rats as a means of disseminating plague, but the other is an additional factor. Speaking of rats in disseminating plague, I have noticed in two or three epidemics in which I have had some experience, the number of plague cases in human subjects has borne a distant ratio to the number of plague rats found, this being shown in the epidemic of 1901 and the Hong Kong epidemic. During the latter epidemic in 1901, when we had the European cases, since the introduction of the disease into that port, we have a history something like this. There were three cases in one house among about twelve employes who worked in a drug store. The three cases that developed the disease were people who slept in this house, and in this house they found a number of dead rats, all of them showing the pest bacillus. I think that is worthy of mention, at least, as a factor in this connection.

DR. EGBERT.—I would like to know something about the present status of immunity and of producing immunity in regard to this disease.

DR. ANDERSON.—That is a very big subject to go into. I will say, however, that from the work that has been done in the hygienic laboratory of the Public Health and Marine Hospital Service, in connection with the use of Yersen serum, our faith in it has diminished considerably. As a curative measure, you have to use large doses, three hundred c.c. intravenously, and often, in repeated doses. As a prophylactic measure, it is efficient for a short time. We have found from the use of Haffkin that the reaction is so great most persons object to it. After having seen it used, as I have, I know I should object to it.

DR. WALTER WYMAN, Washington, D. C.—I think it would be interesting to the members of the Association to know that there is an International Plague Conference being held at the present time in Paris. It is practically a continuation of the International Plague Conference that was held in Venice in 1897, and of a previous conference some years before. The idea is to bring all of the findings and results of the two conferences together, and present new resolutions embodying the best features of those that were adopted at the previous convention, together with the results or measures to be recommended in accordance with the latest developments of our knowledge of the plague. It is a very important conference, and will be represented both technically and diplomatically by all European countries; and this country is well represented through its medical delegates from the Army, Navy, and from the Public Health and Marine Hospital Service. I cannot recall to memory the name of the representative from the Navy, but the Army is represented by Dr. Gorgas, who is so well-known to us all, and the Public Health and Marine Hospital Service is represented by Assistant Surgeon-General Geddings, who is an expert on plague. He was also technically a delegate representing the United States at the International Conference held in Venice in 1897. He writes me personally, although I have seen as yet no official report, that it is evident the rat will play an important part in the preventive measures of spread of the plague from one part of the world to another. In the report of the delegate from the service to the recent International Congress of Hygiene and Demography, the results there with regard to the rat were very decisive and strong, so that it may be that there will be some international agreement made with regard to the destruction of rats wherever possible. For my part, I think such an agreement is entirely practicable, the idea being to disinfect and fumigate vessels for the purpose of killing rats at times when they are empty. I have practically started that on the Pacific Coast, and have recommended it to the officers of this Service who are on duty in the Orient. There are officers at Yokohoma, three in

Japan, and three in China, one at each port, and we have endeavored to persuade the steamship companies themselves to utilize such opportunities to fumigate vessels to kill rats. Whether the agreement should go further than that with regard to seaboard cities for the eradication of the rat, I don't know as yet. The matter is still *sub judice*. I believe the Japanese government started such a movement some time ago, but it will be taken up seriously in the future.

DR. JOHN W. ROSS.— I would like to have Dr. Perry tell us something of the role of the flea upon the rat.

DR. J. C. PERRY, Washington, D. C.— There is a question as to the role of the flea in spreading plague from the rat to man, and many observers claim it is a potent factor. I have made no investigations myself, but know what the English surgeons are doing. They are doing good work in trying to elucidate this point. They are getting all varieties of fleas; fleas have been procured from every part of the country and from all kinds of rats, the object being to find if a particular species of flea on a rat is infected with plague, and if this same flea is found upon a human being — if they can establish that link, it would be an important factor as showing that an infected flea will infect a person, and they are doing good work along this line.

Another theory regarding rats is this: The Egyptian sanitarians believe that an epidemic of plague starts with a new crop of rats; in other words, that would explain the dying out for a few months of plague. We know that in Hong Kong and Manila plague starts in January, as a rule, increases in February, reaches its maximum about May or June, and the first or middle of September it is over until the next January. The Egyptian sanitarians claim, and the English authorities believe there is something in it, namely, that the plague starts with a new crop of rats to be infected. It has a cycle corresponding to the development of the disease in rats.

Professor Franklin C. Robinson, Brunswick, Maine, Chairman, read the Report of the Committee on Disinfectants and Disinfection. (See p. 208.)

Dr. Fernando Lopez, Mexico, Mexico, read a paper entitled, "An Experimental Study of Hydrocyanic Acid as an Insecticide." (See p. 214.)

DISCUSSION.

DR. JOHN S. FULTON, Baltimore, Maryland.— Mr. President: This interesting series of experiments by Dr. Lopez should go far toward commending the usefulness of hydrocyanic acid vapor to practical sanitarians, especially in their operations against diseases which are conveyed by rats, flies, mosquitoes, and other household pests.

Experience with its use in agricultural operations is large, and it has led to no mortality. It has been used against the parasite infections of plants quite extensively, without any casualties having been reported; and it is disappointing as well as surprising to me that sanitarians are afraid to use it.

So far as I know, the first attempt to bring hydrocyanic acid to the notice of sanitarians was made in 1901, when I published a short paper in regard to its effect upon bacteria in *American Medicine*. At Indianapolis in the same year Dr. Stokes read a paper before this Association on its use in public health work, with especial reference to the destruction of animal life, which excited a good deal more interest than enthusiasm. The reason for the apparent approval and the practical neglect of hydrocyanic acid is the fear of its poisonous effects. Dr. Lopez's experiments show that he has treated the agent with the utmost respect, making it clear that it is necessary to get speedily out of the rooms and to allow much time to elapse before re-entering the rooms after fumigation. It might be imprudent for me to say that these precautions have received excessive emphasis, but I do say, from a considerable experience in the use of hydrocyanic acid vapor, that its imputed dangers are very much exaggerated.

After experiments in Baltimore I have repeatedly, indeed usually, entered the room at once on opening the door, taking the precaution of a deep inspiration first and not breathing while in the room. A large house can be rapidly opened by going from window to window and getting a fresh breath at each.

Our method of generating the gas has certain advantages. We use three jars at different levels, the lowest on the floor contains the cyanide, the intermediate jar next above contains the water, and the highest and smallest jar contains the sulphuric acid. The acid is put through a small tube into the water and one stirs the water while that goes in. The intermediate jar connects with the lowest, or cyanide jar, by a self-actuating siphon which starts as the last few ounces of acid flow over. When that begins it is time to leave.

Our experimental room has a broad shelf at its single window and here we put our experimental insects and animals.

In most of our experiments we had the room closed before the effervescence began, and were posted at the window, one to watch and report events and the other to keep the time and make notes. The time notes were very accurately made and I may say that in general our results were obtained in less time than those reported by Dr. Lopez.

We used in our experiments 33 grammes of potassium cyanide to each 100 cubic feet of space.

Flies and mosquitoes are very easily killed from two to three minutes after the effervescence begins. Neither flies nor mosquitoes have any skill at hiding themselves. The mosquito finds a shadow and the fly a light spot.

We found ants to be more resistant. We attempted to rid a yacht of ants and fumigated twice without destroying all the insects. Their domestic headquarters were in the lining of the ice-box, where they were protected by the zinc lining on one side, and by first-class mahogany cabinet work on the other. We rid the boat of them, but not at two trials. The gas is however very diffusible, and we have repeatedly killed ants, bed bugs, and roaches, enclosed in glass under nine inch plugs of cotton. Rats are easily killed by hydrocyanic acid gas. When the cyanide is dropped into the acid, so liberating the gas very rapidly, a rat must escape in 30 seconds or perish. He will not be killed in 30 seconds but will inevitably be disabled. If rescued in three minutes a rat may recover. This is in contrast with the destruction of rats on shipboard by the vapor of sulphur dioxide. Sulphur dioxide gives notice, and rats have considerable time to look for an exit. After sulphur fumigation dead rats are found in greatest number near the hawse-pipes and other openings.

Only once we have fumigated a house in the middle of a block without notifying the people on either side. This was done on account of bed-bugs. We were entirely successful although the bed-bug is a good hider. The operations did not attract the attention of neighbors, and in half an hour after the door was opened the paper hangers were at work in the house.

Fleas are occasionally a very serious household pest. Hydrocyanic acid kills them promptly. Their favorite habitat is in the loose mortar joints by cellars and in straw matting.

I hope I do not make light of the danger attending the use of hydrocyanic acid. It is dangerous, but by no means to a prohibitive degree. I do not know when it began to be used by the U. S. Department of Agriculture, but its use is rather widespread among nurserymen, and there is no reported mortality. Dr. Howard, Chief Entomologist to the Department of Agriculture, recently published a bulletin giving directions for the employment of hydrocyanic acid against household pests, so that I assume that he is not afraid to entrust it to unskilled hands.

Confronted as we are at present with the need of a gaseous poison in the control of plague, yellow fever, and typhoid, hydrocyanic acid seemed to me to be the best available agent, and the experiments of Dr. Lopez go far to support that view.

DR. LINDSLEY.— What is the cost of cyanide of potash for this work?

DR. FULTON.— About thirty cents a pound. The cost of sulphuric acid or the commercial acid will be about two and a half or three cents a pound. The proportions are one part of the cyanide of potash, one and a half sulphuric acid, and two and a quarter of water.

DR. HURTY.— Does it kill bacteria?

DR. FULTON.— I hardly think it is practical for that purpose, although it kills bacteria that are not more resistant than the typhoid bacillus.

DR. LINDSLEY.— How about the destruction of cockroaches?

DR. FULTON.— They are easily destroyed. There is less difficulty attending the killing of cockroaches with hydrocyanic acid vapor than there is the destruction of ants. Roaches and flies are about in the same class, with the exception that the roach can hide a little better.

DR. HENRY R. CARTER, Baltimore, Md.— I wish to say, evidently this is an ideal method and agent for killing mosquitoes when this has to be done in Pullman coaches. Sulphur is efficient; it is cheap, but frequently causes great damage, and quite a long time is consumed in its use. But with this agent, I take it, there is an absolute absence of injury to the material of the coach, and but a short time is required to apply it. The absence of bad odor, etc., following it is such that the extra expense is a mere matter of moonshine. It is unquestionably the ideal agent to use for that purpose.

DR. J. M. LINDSLEY, Havana, Cuba.— In regard to sulphur, a gentleman from New York has an apparatus with which he makes SO_2. I am not a chemist, and have no idea whether this can be done; but he burns sulphur as we used to burn it in the Marine Hospital. There is absolutely no destruction of fabric from its use; it does not take the color out of the goods, and he says it will kill bacteria, bugs and cockroaches in a few hours.

The President wanted his boat disinfected for roaches and bugs and he got this apparatus with which to disinfect it. It is claimed that a vessel of that size can be disinfected in a comparatively short time. They can pump the gas into the vessel in about an hour. After pumping it in, I asked him how long it would be before the vessel could be opened up? He replied, "About four hours." If that is so, then sulphur is the best disinfectant, because it is cheaper than any other agent.

DR. QUITMAN KOHNKE, New Orleans, La.— It seems to me, there is room for experiment in the choice of disinfectants between sulphur and hydrocyanic acid. Whenever there is an element of danger attached to the use of a disinfectant, except in the expert use of it, there is a

doubt as to the advisability of its general application. There is a thread of warning running through the paper of Dr. Lopez from beginning to end. I have in mind the disinfection of railway coaches, and the application of disinfectants by persons other than experts. Mosquito disinfection can be best accomplished by means of sulphur. A formula could be prepared for sulphur disinfection which would guarantee materials and fabrics against injury; but no formula can be advised for the use of hydrocyanic acid that will free its handling from danger to life. I believe experiments should be made with sulphur along this line — the disinfection of railroad cars with the least inconvenience.

Supposing the interior of a coach is filled with vaporized ammonia, it would seem reasonable to expect the ammonia to coat the inside of the coach and all fabrics exposed to danger from sulphur; then inject the sulphur or burn it in the car and after burning the sulphur inject another dose of vaporized ammonia.

It seems to me, this process should protect the material or the fabrics of the interior of the coach, while insuring disinfection of the car, so far as insects are concerned.

It would certainly destroy yellow fever mosquitoes. The previous application of ammonia would not interfere with the destructive effects of sulphur against mosquitoes, but it would, I believe, protect the materials or fabrics; and experiments in this direction ought to produce very important results, and doubtless will assist in the solving of the problem of railroad disinfection which is now not an easy one.

DR. HAASE, Memphis, Tenn.— I would ask Dr. Fulton how he disinfects railway coaches with hydrocyanic acid?

DR. FULTON.— We do not disinfect railway coaches in Maryland except in cases of smallpox; otherwise the disinfection must be done by someone else. I do not know anything about the disinfection of cars with this agent.

PROFESSOR ROBINSON (closing the discussion).— With reference to the remarks of Dr. Abbott, I wish to say that one of the articles I referred to in the report gave a kind of official investigation of the comparison between carbonic acid and sulphur as disinfectants, showing clearly that the former was not as efficient as sulphur, and recommending that it be not used. I don't see any good reason why it should be.

In regard to the remaks made by Dr. Lindsley, there must be some mistake made on the part of the man who told him about the preparation of SO_3. Possibly Dr. Lindsley's remarks had reference to sulphur dioxide.

As to what was said by the gentleman from New Orleans (Dr. Kohnke), in reference to injecting ammonia into railway cars, from a

medical standpoint, one would hardly give an antidote first, and then administer medicine for the purpose of acting on that antidote. That is what you would do if you used ammonia in a railway car, followed by sulphur dioxide. The ammonia would attack the sulphur dioxide first. The ammonia would not seek out the fabrics and cling to them; it would distribute itself through the air of the car.

The killing of insects is a large part of the problem of disinfection. The views of French experimenters vary materially, and for scientific reasons, as to the use of sulphur as a disinfectant. We can't see any good reason why the recent experiments of one man should overthrow those that have been made during the last ten years. I think if we would get a clear idea of the agent Dr. Lindsley referred to as SO_2, it would be found that there is something more in it than sulphur and oxygen, because he has told us it does not destroy fabrics or take the color out of the material that is subjected to disinfection by it. The influence of sulphur dioxide in destroying cloth is not great; it is only when it forms sulphuric acid by slow action that it destroys, and perhaps a week after it has been used the thing goes to pieces. You know if you have used it that after cloths have been subjected to this agent, and you think they are all right, when you have kept them for a time they become full of holes because the sulphuric acid has been acting slowly. Nothing has been more fully established than that sulphur, when used in sufficient quantity for the purpose of disinfection, is more or less destructive to fabrics.

As to the use of hydrocyanic acid, Dr. Kohnke has shown clearly that sulphur dioxide is much less dangerous. I do not know what would happen if health officers should kill somebody with hydrocyanic acid. I don't know whether they would be liable or not; but I am inclined to think it is an agent that should be used with extreme care and great caution. I would not think of sending such an agent to a country town to be used by inexperienced persons; but in cities it can be used advantageously.

After which the Association, on motion, adjourned until Friday, October 30th.

FRIDAY, OCTOBER 30, 1903 — FOURTH DAY — MORNING SESSION.

The Association met at 10 A. M., and was called to order by the President.

THE PRESIDENT.— We will listen to a report of the Executive Committee by the Secretary.

THE SECRETARY.— As to the resolution offered by Dr. Monjaras in his paper, the Executive Committee recommends that it be referred to the Committee on Demography and Statistics in their Sanitary Relation, to report next year.

THE PRESIDENT.— What will you do with the recommendation of the Executive Committee?

GENERAL STERNBERG.— I move the reference of the resolution to that committee. Seconded and carried.

THE SECRETARY.— The Executive Committee proposes the following amendment to the constitution, which it offers now, to be voted upon at the next meeting:

AMENDMENT TO ARTICLE III OF THE CONSTITUTION.

The members of the Association shall be known as Active, Associate, *and Foreign.*

The Executive Committee shall determine for which class a candidate shall be proposed. The Active members shall constitute the permanent body of the Association, subject to the provisions of the Constitution as to continuance in membership. They shall be selected with special reference to their acknowledged interest in, or devotion to, sanitary studies and allied science, and to the practical application of the same. The Associate members shall be elected with special reference to their general interest only in sanitary science, and shall have all the privileges and publications of the Association, but shall not be entitled to vote or hold office. *Health officials, and other persons especially interested in matters relating to the public health of countries not included in the Association, may be elected as Foreign members. They shall have all the privileges and publications of the Association, but shall not be entitled to vote or hold office.*

Delegates from national, state, provincial, and municipal boards of health, organized sanitary associations, and the army, navy and public health and marine hospital service, shall be entitled to be enrolled as Active members upon presentation of their credentials to the Executive Committee. Members, not delegates from such bodies, shall be elected as follows:

Each candidate for admission shall first be proposed to the Executive Committee, in writing (which may be done at any time), with a statement of the business or profession and special qualifications of the person so proposed. On recommendation of a majority of the committee, and on receiving a vote of two-thirds of the members present at the regular meeting, the candidate shall be declared duly elected a member of the Association. The annual fee of membership in each class shall be $5.00.

THE SECRETARY.— For the information of the members of the Association, I desire to say that the following resolution was adopted by the Executive Committee:

WHEREAS, It is proposed to secure the establishment of a periodical devoted to the publication of the proceedings of the American Public Health Association; to the presentation of papers and discussions relating to public hygiene and sanitary administration, and to aid in the dissemination of current news concerning the promotion of health and the prevention of disease; therefore, be it

RESOLVED, That a committee of three be appointed by the Chair to make inqiuiries in reference to the feasibility of establishing such a publication, and said committee shall report to this Association at the next annual meeting.

The Chair has appointed Drs. Henry D. Holton, Gardner T. Swarts, and Wm. Bailey as this committee.

On motion, the recommendation of the Executive Committee was concurred in.

THE SECRETARY.— The Executive Committee submits the following resolution, which it adopted:

RESOLVED, That a committee of three be appointed by the Chair to inquire concerning the advisability of requiring that all reports and papers to be presented at the annual meetings of this Association, shall hereafter be printed and distributed to the members one month before the day of meeting; said commitee to report at the meeting to be held in 1904.

The Chair has appointed as this committee Drs. Henry Mitchell, General George M. Sternberg and Peter H. Bryce.

THE SECRETARY.— With regard to the resolution offered by Col. W. F. Morse at a previous session, the Executive Committee recommends that this resolution be referred to the Standing Committee on Disposal of Garbage.

THE PRESIDENT.— You hear the recommendation of the Executive Committee. What action will you take?

On motion, the recommendation was concurred in.

THE SECRETARY.— The following resolution offered by Dr. Lee was considered by the Executive Committee, and it is recommended for adoption:

WHEREAS, Recent experience has abundantly demonstrated the fact that the curriculum of medical instruction which has been in effect for the past twenty-five years has signally failed to furnish medical students with that practical acquaintance with infectious diseases, which is essential to enable them to make a prompt and reliable diagnosis of such affections in the earlier years of their practice, therefore,

RESOLVED, That it is the sense of this Association that all who undertake the education of medical students should make provision for their clinical instruction in the diagnosis of all infectious diseases that are of common occurrence in this country.

GENERAL STERNBERG.— I move the adoption of this resolution. Seconded and carried.

THE SECRETARY.— The following resolution offered by Dr. Kober was considered by the Executive Committee, and it is recommended to the Association for adoption:

RESOLVED, That this Association approves in the main the recommendations of the Committee on Teaching of Hygiene and Granting Diploma of Doctor of Public Health, and recommends that the Government of the United States be requested to provide a professorship in hygiene both at the military and naval academies.

On motion, the resolution was adopted.

THE SECRETARY.— The Executive Committee recommends that the resolutions presented by the Committee on the Army Canteen be adopted by the Association.

DR. J. N. MCCORMACK.— I move the adoption of the resolutions. Seconded.

DR. J. M. LINDSLEY.— I wish to file a protest against these resolutions.

The president put the motion to adopt, and it was carried with two or three dissenting voices.

THE PRESIDENT.— The next order is the report of the Advisory Council.

DR. HENRY M. BRACKEN, St. Paul, Minnesota. —As secretary of the Advisory Council, I will say that the Council met yesterday and action was taken as to the next place of meeting, the Council recommending Havana, Cuba, as the place for holding the next annual meeting of the Association on the request of Dr. Finlay, acting for the government and for the medical profession of that place.

The Advisory Council begs leave to report the nominations of the following officers: President, Dr. Carlos J. Finlay, Havana, Cuba; First Vice-President, Dr. Jesus E. Monjaras, Mexico, Mexico; Second Vice-President, Dr. W. C. Woodward, Washington, D. C.; Treasurer, Dr. Frank W. Wright, New Haven, Conn., nominated to succeed himself. The Secretary holds over, so that no action was taken in regard to that office.

The names of those proposed for members of the Executive Committee are Drs. A. H. Doty, John L. Leal, and Professor F. C. Robinson.

DR. J. N. MCCORMACK.— I move the adoption of the report of the Advisory Council. Seconded and carried.

THE PRESIDENT.— I will request General Sternberg to escort the President-elect (Dr. Finlay) to the platform.

Dr. Finlay was warmly received by the members in ascending the platform. He said:

I cannot thank you enough, nor tell you how highly I appreciate your having accepted the invitation to go to Havana next year. I think you will find the place very agreeable and a great novelty to most of you. I have no doubt you will pick up a great many original points concerning the manner in which the public health interests are handled there. Our methods are a little different from those adopted in other countries. (Applause.)

I appreciate the honor you have conferred upon me in making me your President. I am sorry you have not chosen a better man. My condition of hearing is an obstacle. When I consider the eminent men who have presided over the deliberations of this body, I feel the great keenness and ability that are required for the discharge of the duties of this office. I have had personal experience in Havana in the different branches that belong to this Association, connected with the Public Health and Marine Hospital Service, and their relations, and I know how important it is that the position of other countries should be properly maintained.

Again I thank you very heartily for the distinguished honor you have conferred upon me, and I assure you that I shall do my best to fill the office. (Applause.)

THE PRESIDENT.— I wish to announce that, in accordance with the recommendation made in the paper of Dr. Licéaga, for a Committee on International Relations, the members of that committee are Drs. Frederick Montizambert, Henry R. Carter, Jesus C. Monjaras and Carlos J. Finlay.

Dr. Ulises Valdez, Mexico, Mexico, read a paper on "Measures to Prevent the ı ropagation of Venereal Diseases." (See page 244).

DISCUSSION.

DR. LOUIS L. SEAMAN, New York.— Mr. President: I just want to cite a single instance in endorsing the sentiments of the paper with reference to the establishment of the lock system for the segregation or control of prostitution in the Orient. In India and Burmah, and all the Oriental British ports in 1884, there was established this lock system, and all diseased prostitutes were corralled and kept under control. Nothing acted so well as this in eradicating these diseases in the British army, so that in a few years syphilis was comparatively unknown, and other venereal diseases also. In 1889 the "Exeter Hall crowd," as it is known in the vernacular, succeeded in introducing in Parliament a law which abrogated this system and repealed it. There

is no single disease which invalids so many soldiers in the British service to-day, as syphilis, in consequence of the recurrence of that disease since the abrogation of the lock system.

DR. M. HAASE, Memphis, Tenn.— The health department of the city of Memphis has for the past three years attempted to get an ordinance through, asking for the systematic examination of prostitutes, but prostitution being under the supervision of the police department, it was requested that the facts come from the police department, and up to this time the police department has not agreed with the health department that examination is necessary. In New Orleans I believe there is such an ordinance in effect, and I would like to hear from Dr. Kohnke as to how it is carried out.

DR. QUITMAN KOHNKE, New Orleans, La.—There is no such an ordinance in New Orleans. An unsuccessful attempt was made some years ago to pass an ordinance giving to a contractor the right to examine and charge fees; but it was regarded at that time as a money-making scheme, and was defeated on that account. The present health authorities are in favor of establishing such an inspection as that now operated in the city of Havana. But we fear that public sentiment will be so opposed to the idea of indirectly appearing to encourage prostitution, that there is not much hope for the success of any such movement. It is undoubtedly beneficial to any city to regulate this evil; but public sentiment on this question is very much like public sentiment on alcoholic indulgence in soldiers' camps, and the same reason why the canteen is opposed will probably actuate the opposition to any attempt at regulating the other evil.

DR. W. H. CRANE, Cincinnati, Ohio.—Instruction and examination are carried on in Cincinnati under the general ordinance of infectious diseases. This has met with some measure of success. The health officer in so doing has the approval of the medical profession. The inspection is carried on by the members of the sanitary force, known as the district physicians, who examine prostitutes regularly twice a week. A suspected case is examined very carefully. A microscopical examination is made for the presence of the gonococcus, and when the returns are positive in the gonorrheal cases, the patients are sent to the general city hospital, and confined in the venereal ward. They are not discharged until microscopical examination shows the non-existence of gonococci. Syphilitic cases are seen by the physician, who is a genito-urinary specialist, and are not discharged until he confirms the statement that the patients are well. The attitude of the profession has been favorable toward this inspection. It has met with some opposition, but we feel that it will be carried on in the future, and it has been productive of a great good in Cincinnati.

DR. SAMUEL H. DURGIN, Boston, Mass.—So far as the hospital treatment of these cases of venereal disease is concerned, I think it would be a great mistake to attempt to segregate these cases by placing them in a separate hospital, because it carries on the degradation to a degree which is, in my mind, a great injury to a class of people who should not be wholly abandoned in this way, or stamped before the public as worthless. As is done in Cincinnati, an addition to any respectable hosptial can be made and fitted for this class of cases. I think we will get the best possible effect where the health department has a right under the law to inspect prostitutes. The moment we attempt to establish a hospital purposely for this class of cases, I think in nine times out of ten we will be defeated by the municipality. We have a right in Massachusetts, according to the law, to place these cases in a hospital, and we have the authority to hold such patients so long as they are infectious, and I think this is the best possible way to treat this class of cases. Treat them medically like any other sick persons, and not attempt to segregate them.

DR. S. R. TOWNE, Omaha, Neb.—I wish to relate an incident that occurred in a small community in our State. The post was Ft. Robinson, near Crawford. The surgeon of the post found that he was very busy with the treatment of this class of cases. A lady physician in a town near by was employed on a salary by the authorities of the city, and by moral force she compelled every diseased woman to submit to treatment when infected, and, of course, in both instances, at the post and in the town, the local authority was vigorously exercised, so that both males and females were practically under control. Very soon the amount of contagious disease diminished to a small per cent. of what it has been. Of course, these methods cannot apply to a large municipality.

DR. J. M. LINDSLEY, Havana, Cuba.—While in Cuba, I examined into this matter a good deal, and I found that efforts were made to carry out the law, but that amongst the soldiers there was as much disease as we had in any other place; although the women were inspected twice a week, and were always carried to the hospital if sick. It is the women who do not take out licenses from whom we get more contamination than from those who take out licenses.

DR. CARLOS J. FINLAY, Havana, Cuba.—Since some allusion has been made to Havana, I might say that the system which is adopted there works very well, so that the propagation of venereal diseases by those women who are licensed has been reduced to a very large extent. These diseases are conveyed mostly by women who are not licensed, the clandestine prostitutes.

As to these women carrying on prostitution without licenses, I will say that under our law they lose entirely their right to continue their trade, and they are liable to be arrested, so that I do not think the case cited by Dr. Lindsley is actual for a moment. These women have to take out their licenses monthly, and if it is found they have not got them, and are found in the district allotted to prostitutes, they are arrested and sent to the hospital.

DR. H. LINCOLN CHASE, Brookline, Mass.—I would like to say a word or two in connection with this paper. I did not come here specially prepared to discuss this subject, but I believe there are two sides to it. Dr. Valdez has given us a carefully prepared paper. In the city of Boston, however, this matter was the subject of an evening's discussion before the Suffolk District Medical Society a few years ago, and Dr. Arthur K. Stone, of the Massachusetts General Hospital, read an excellent paper, in which he reviewed this subject at great length. He was strongly of the opinion that it was unwise and wrong for several reasons, not only morally, but from the standpoint of policy, to license brothels in cities or anywhere else. Only recently Dr. Marshall H. Bailey, the medical visitor to Harvard University, read a paper before the Cambridge Medical Society on the same subject, and after his years of experience at Harvard University and in Boston, he came to the same opinion as Dr. Stone, namely, that licensing had been a failure in Paris, Vienna, and other European cities, and would be also in Boston, Philadelphia, and other American cities. He advocated such measures as have been spoken of by Dr. Durgin, and which seem to me to be wise and just. But the licensing of brothels does not seem to be wise from the evidence brought forward by Dr. Stone and Dr. Bailey.

Dr. Manuel Uribe Troncoso, Mexico City, Mexico, read a paper entitled "Hygiene of the Eyes." (See p. 250.)

The resolution accompanying the paper of Dr. Troncoso was referred to the Executive Committee.

Dr. M. Marquez, Mexico City, Mexico, read a paper entitled "On the Pavement of Hospital Wards Considered from the Standpoint of Asepsis and Antisepsis." (See p. 247.)

Dr. J. N. McCormack, Bowling Green, Ky., offered the following resolutions:

RESOLVED, That the cordial thanks of this Association be tendered to the Local Committee of Arrangements, and especially to its Chairman, Dr. Wm. C. Woodward, for the admirable provisions made for the transaction of the business, and for the social entertainment of its members and guests.

To the Hon. H. B. F. MacFarland, President of the District Board of Commissioners, and the physicians and citizens of Washington for a most enjoyable public reception.

To the Hon. and Mrs. John B. Henderson for the delightful evening given our members and guests at their hospitable home.

To the National Vaccine Establishment and Dr. and Mrs. Ralph Walsh for a pleasant entertainment; to the Secretary of the Navy for the use of the Marine Band; to the retiring President, Dr. Walter Wyman, for the able and impartial manner in which he has presided over our deliberations; to the various transportation lines for reduced rates, and to all others who have in any way contributed to our comfort and entertainment during this most pleasant and successful meeting.

MR. MILTON A. EMBICK, Boiling Springs, Pa.— I move the adoption of the resolutions as presented. Seconded and unanimously carried by a rising vote.

THE PRESIDENT.—The thirty-first annual meeting has come to a close. As President of the Association during the year just closing, I wish to thank you all for your attendance here, for the care you have exercised in the preparation of the reports and papers which have been read, and for the great interest manifested in the discussions.

I wish to thank you for your very considerate treatment of the Chair, and I look forward to our next meeting in Havana, under the auspices of the government authorities of the Island of Cuba, represented by our distinguished newly-elected President, Dr. Finlay, with great pleasure. I trust it will be the effort of the members of the Association to be present at that meeting.

With these few remarks, and thanking you again for the honor you conferred upon me last year, and for your considerate and kind expressions, I now declare this Association meeting adjourned.

PAPERS AND REPORTS PRESENTED TO THE SECTION OF BACTERIOLOGY AND CHEMISTRY.

THE DEVELOPMENT OF AMERICAN BACTERIOLOGY.[1]

By H. L. RUSSELL, Madison, Wisconsin.

Those of us who hail from the middle west, where the cross-currents of a mixed civilization have mingled many ethnic strains, have perhaps less appreciation of the pride of ancestry than those whose lot it has been to dwell in the shadow of the old family rooftree. Not often does the genealogical fever strike the pioneer or his immediate successors. Generally he is too busy in hewing out a home for himself and family to bother with historical studies. It is only after he strikes it rich that he feels the need of a coat of arms, or his wife seeks admission to the Society of Colonial Dames. In large measure too are historical retrospects likely to be disregarded by those of us who have turned our attention to some of the newer lines of study that are now possible.

The student of botany or chemistry or physics has a long and glorious past in which he can revel. If he attempts to prepare a chairman's address, he may go back in the history of his chosen field as far as he wishes to carry his hearers, and may readily gain momentum as he sweeps from the glorious achievements of one master to the next; but the student of a science which in itself is scarcely out of its pioneer days is much more sharply limited in such a retrospect.

The science with which most of us who are here gathered have to do is hardly old enough to have a past. True it is that much valuable work has been done in the earlier decades of the century just closed, or even before, but as a scientific subject on a more or less exact foundation, the past two or three decades have given us nearly all the knowledge we have. Previous to this there was no *science* of bacteriology. The theories and ideas then accepted were not based in any large measure upon scientific deductions made from closely controlled experimental work, but were more the result of hypothetical postulates, which were often the outcome of merely polemical disputes.

The change which confronts the student of to-day is great. Now he finds a large mass of accumulated data, more or less completely organized, and the underlying principles in many lines quite thoroughly marked out. The boundaries of the province have been more or less

[1] Chairman's Address.

sharply defined, and we are recognizing the limitations of even the germ theory of disease, which in earlier days was strained to cover a much wider range of phenomena than future investigations sanctioned.

Bacteriology is essentially a present-day science. The practical results which flow directly from its study need no emphasis, as they form so important a part of scientific endeavor that they cannot be overlooked. They strike home so closely to the life of every individual that the teachings of the science have been accorded a reception in the public mind which shows us the responsibility as well as the opportunity that is before us. The degree of activity which is to be noted indicates a virile, growing subject. If one is to keep up in any considerable measure with the literature of the day, he finds a strenuous course laid out for him.

The rapid progress accorded the science in our own country has led me to wonder whether it might not be worth our time to pause for a few moments to consider some phases of its growth. It seems to me if such a consideration is pertinent, it is doubly so before an association which has done so much within the last few years to foster such development. The distinctively bacteriological societies that we have in America are not old enough to have much more than a kindergarten birthday; nevertheless, they have already been a powerful means of crystallizing bacteriological effort in this country, and have undoubtedly stimulated greatly experimental inquiry. I recall in this connection the earlier days of my own short scientific experience. A decade ago there was hardly any scientific meeting for the bacteriological student who was not closely in touch with the medical aspect of the work. I remember some few of us used to attend the meetings of the American Association for the Advancement of Science. This was long before the days of the Section on Preventive Medicine. The botanists were our sponsors, but there was little time or opportunity for any discussion on things strictly bacteriological.

In considering the development of American bacteriology, it is not intended in any way to intimate that there is an American school in the sense that the Berlin or Paris school used to be spoken of some years ago. The survival of the fittest in matters of technique has now led to the almost universal adoption of methods that have been found to be best adapted to the study of the various problems, and these standard methods are more or less commonly followed everywhere. Fortunately, the training of the majority of our American bacteriologists who have studied abroad has not been confined entirely to any one country, although, following the course of most American students, the larger number have been German trained. This more cosmopol-

itan training has had its impress on American work, and has given a breadth of view that has been educationally of great advantage.

In America it is of course true that here and there individual workers have been engaged in bacteriological research for over a quarter of a century, but within the last few years there has been such an extension of activity, not only in the amount but in the scope of work performed, that we may fairly say that American Bacteriology is now on a footing that commands scientific attention from older centers of research.

The one marked characteristic that is to be noted among the American bacteriologists is that they have been recruited from widely different preparatory fields. Like the nation itself, which has assimilated races and peoples of widely varying origin, the students of this science have had their preliminary training in lines of work which are strikingly remote from each other. Naturally the great majority of them have approached the subject from a medical point of view. This is true not only of those whose work has been in connection with medical schools, but with students of public health, particularly those in the board of health laboratories. The earlier development of the science in the field of medicine for a long time controlled bacteriological activity, but it is fair to assume at the present time that bacteriology is no longer to be regarded simply as a protégé of the science of healing, but that it should stand on its own foundation with other biological sciences. A considerable number of our bacteriologists have come at their life-work from the botanical or general biological point of view. Others, recognizing the importance of this line of activity in the dairy or in general agriculture, have developed their bacteriology from this special standpoint.

Several factors have been potent in contributing to this many-sided development of the science in this country. One prominent feature has been in the introduction of the study of bacteriology into the regular science curricula of universities.

DEVELOPMENT OF BACTERIOLOGY AS A BIOLOGICAL SUBJECT.

In Europe the work is almost universally carried on in connection with the faculties of medicine, but in our own country, in a number of universities, sometimes even those provided with medical colleges, bacteriology is taught in the regular science work as a part of biological instruction. In such institutions bacteriologists may be trained just as are chemists or botanists. Where work of this scope is given, the bacteria are considered as living organisms and are studied as such. The fact that certain forms are capable of calling forth pathological

processes, or are concerned in the production of certain fermentative products which may possess a utilitarian value, has no weight except as an expression of more or less highly specialized physiological activity. If we consider the phenomena of parasitism broadly, it gives a breadth of perspective that is of greatest service to the student, even if later he should take up a more detailed study of pathogenic forms. So far as I have been able to learn, such preparatory work is especially valuable as a basis on which to raise a more technical or specialized superstructure. It is the general experience of teachers in medical schools that students who have had their elementary bacteriological training in such courses as these are able to make the most progress in their medical work, and obtain a much broader grasp of the subject than the student who yields to the notion that it is much more profitable for him to spend his time wholly on the distinctively disease-producing species.

The importance of this aspect of the subject in America is evident from a consideration of the higher degrees granted in bacteriology by American universities. Although the number of those who are specializing in university work in bacteriology is not large in comparison with those who have made this a subordinate line in their medical course, still it is worthy of note that the number has increased within recent years. Seven doctors of philosophy were granted their degrees in bacteriology at last commencement, and of this number the theses of the majority were on some phase of general bacteriology, more particularly in their chemical relations. This condition marks a type of development in American bacteriology that is more or less unique, and so far as I know is peculiar to our university system. Ten or fifteen years ago students who desired to specialize in bacteriology were obliged to go to European laboratories for their work, but with the great improvement which has taken place in this country in scientific work during this period, the American student finds the facilities of a number of American laboratories equal in many lines to anything he can get abroad.

INFLUENCE OF APPLIED INDUSTRIAL LINES.

Another factor which has been the means of bringing a number of bacteriological students from other than the usual fields has been the demand for trained workers in connection with agricultural and engineering movements. Scientific work in agriculture has been greatly fostered by the development of the agricultural experiment station movement. Although this idea originated in Germany, the development of the system in this country has now far outstripped that in

Europe, particularly in bringing the knowledge of scientific advance within reach of the tillers of the soil. Naturally in the study of soil and crop problems, economic dairying, etc., physics and chemistry especially were recognized as basal studies, but it is now realized that the soil is not composed of a mass of mere inorganic particles, but harbors myriads of living forms, which exert a profound effect upon the changes which go on therein. With this realization the importance of bacteriology has come to be quite generally recognized. The same is true with dairy phenomena. Nearly all of the numerous dairy schools in our distinctively dairy States, in both this country and Canada, have more or less completely organized and equipped bacteriological laboratories. The general importance of the experiment station movement may be recognized when it is known that in the latest published organization list of the station staffs there were over twenty-five persons classed as bacteriologists, a number perhaps small, but representing a growth from nothing a few years ago.

In the application of bacteriology to engineering practice, the matter of safeguarding the health of communities by the proper treatment of water supplies and disposal of sewage has been given a marked impetus in this country. Not an inconsiderable number of American bacteriologists, particularly those of this Association, are to be ranked among those whose chief line of work belongs to that phase of hygienic endeavor which is concerned with problems of this class. At the present time public sentiment on matters of this sort is far from being up to the European standard, but it is on this class of bacteriological workers and their engineering confrères that the responsibility lies of awakening public interest to the extent that the typhoid death-rates will no longer publish to the world at large that with us science and practice do not go hand in hand. As a nation we have the reputation of being practical, but when we fail to provide our own families with pure, wholesome water, or maintain them under conditions that invite epidemic disease, we fail seemingly to exercise that degree of forethought which common prudence would seem to dictate.

Of course the influence of these foregoing factors which have been mentioned on the general growth of the subject does not by any means equal that which comes from the medical point of view, but they are so generally ignored that it seems worth while to emphasize their relation here as to the effect which they have had in broadening the lines on which American work has been done. Naturally, with the much broader development of medical institutions, in the curricula of which bacteriology now occupies a permanent and fixed position, the pedagogical side of the science from this point of view will be emphasized. In the numerous diagnostic laboratories, for hospital and

general service, the practical laboratory side will find possibilities of great extension.

RESULTS ACCOMPLISHED.

The results which are to be credited to American bacteriology naturally cannot be compared in quantity with the much larger output which is to be observed in the foreign field, but it is worthy of note that in a number of lines American investigators occupy a most commanding position. When it is remembered that the science in this country is not much more than a decade and a half old, it is certainly apparent from the amount and character of the output that the study is in a flourishing condition. Perhaps one of the most striking features of American investigations is the fact that they cover such a wide range of activity. This follows of course from the way in which the work has been organized in this country. In a considerable number of cases some of the most valuable work done by American bacteriologists has been, strictly speaking, in fields beyond the limits of bacteriology proper. This science, young as it is, has already been the means of developing cognate lines of effort concerned with organisms and phenomena that do not fall within the strict province of the bacteriologist. In fact, we may say that the French idea is rapidly gaining ground, and that our science would be more correctly denominated if it was called micro-biology, than restricted to the study of the bacterial forms.

Naturally the most important contributions to this line of science have been in the field which has included the greatest amount of endeavor. The relative predominance of medical inquiry has of course resulted in the maximum degree of effort being spent in this line. In this field American workers have made great progress in attacking American problems. It would be impossible and perhaps unnecessary to go into such a recital in detail, yet it may not be amiss to mention in passing some of the more salient discoveries which have been made in the respective fields. Take the work of Theobald Smith and his associates on Texas fever. The problem here was to unravel the mystery surrounding a disease which from a practical point of view seriously impaired the agricultural development of a large section of our country. At the time when the causal agent of this disease was discovered, the relation of protozoan forms to pathological processes was not as well appreciated as it is now. The discovery of the causal organism and the working out of its life history, especially in relation to its intermediate host, will always remain as a classic example of experimental inquiry, and the successful termination of such researches in the development of efficient protective measures attest the value of these discoveries from a purely practical point of view.

From the practical results that have followed from scientific investigations, no line of work has been fraught with more import than that which has been carried on by the lamented Reed and his associates on yellow fever. Curiously enough, the inception of the theory that this disease was transmitted by mosquitoes was American, yet the idea lay fallow for a considerable period of time, until the researches referred to were so convincing that the whole system of prophylaxis was changed almost in a day. The curse which for centuries has rested on the seaport towns of our sister republics as well as menaced our own borders seems likely to be removed as if by magic.

In the line of problems that have engaged the attention of many other observers may be mentioned the venom work of Flexner and his associates, also the researches which have been made on Shiga's organism and their relation to infantile disorders; the important morphological researches of Opie and MacCallum on the significance of the flagellated structures in malarial parasites and other hemamebæ; the recent discoveries of Councilman on smallpox.

The work of Smith and Ravenel on the tubercle bacillus has been not only opportune but convincing, and the work of de Schweinitz, Trudeau, Pearson and Gilliland on immunization of animals against this organism bids fair to make an advance step in the warfare against this disease that will be of greater importance than even the discovery of the causal organism itself.

It is also a matter of considerable pride that American bacteriologists should have even been the pioneers in some of the fields of research. The demonstration of the etiology of plant diseases of a bacterial nature is to be credited to American bacteriology. The first studies on this subject were made on the fire blight of pears and apples by Professor Burrill, and to him and a number of other workers belongs the credit of proving the relation of this disease to bacterial agency. The etiology of this disease has been as thoroughly proven as was that of anthrax, all of the canons of Koch being fulfilled, and yet this work is often not accepted by many European workers. They considered the evidence as inadequate to show that a causal relation existed between the organism and the disease in question.

It is surprising even yet to see the attitude which is taken by many foreign writers on this subject. Text-books of German origin often wholly ignore the relation of bacteria to plants or pass it over with a brief reference in an *Anhang*. It might be thought that this position arose from the fact that these diseases were less common in Europe than here, but since the experience of Harding, who found the well known bacterial black rot of cabbage distributed widely throughout all Europe and even in the botanical gardens of some of the universities,

it seems that a failure to adopt the results of work carefully performed in this country must rest upon some other reason than lack of opportunity to study these maladies.

Another field in which American investigation has been particularly fruitful has been in the study of the problems associated with purification of water supplies, and also in sewage disposal. Problems of this character press most earnestly for solution in older settled countries, and it is therefore a matter of some moment that American laboratories should have played so important a part in the development of this knowledge. The classical researches which were begun by the State Board of Health of Massachusetts in the latter part of the eighties, at which time the Lawrence Experiment Station was founded, have always occupied a foremost position in work of this character. Many of the underlying principles relating to the proper methods of sand filtration were first developed in this country.

In technical methods, too, marked advances have been made. Particularly is this true with reference to uniformity in methods, a condition which has been brought about largely through the efforts of the Bacteriological Committee and Standing Committees of our own Section.

The development of American bacteriology has just begun, but we may fairly say it has been well begun. The present shows a strong school of experimenters, broadly trained, and approaching their problems from a wide range in point of view, a condition that enables them to obtain that proper perspective which is so essential to successful specialization. The future is even richer in promise.

FUTURE PROSPECTS.

The great impetus which is now being given to medical instruction is sure to aid materially in the development of bacteriological work. Within the past decade the requirements of medical instruction have been greatly augmented, and among the sciences to which much more attention is being paid is that of bacteriology. The establishment of research laboratories in connection with greatly improved hospital facilities gives an opportunity for graduate work which will soon equal if not excel the facilities offered anywhere else in the world.

One of the marked characteristics of American philanthropy has been its devotion to education. Of the millions that are annually given to this purpose, not an inconsiderable amount will naturally be used to foster and develop such sciences as this which so strongly appeal to the practical man of affairs, and the establishment of such institutions as the Rockefeller Institute, the Carnegie Institution, and the various

foundations for the special study of restricted fields like tuberculosis will all aid greatly in the development of American science.

For a number of years the government has been doing a large amount of bacteriological work along lines which are primarily of interest to agriculture, but the scope of these studies has been materially broadened within the last few years, through the formation of the Public Health Service in connection with the Marine Hospital Service. Work along these sanitary or hygienic lines will also doubtless be greatly extended through the medium of State and municipal public health laboratories. The original function of these laboratories was largely of a routine character, but with the development of bacteriology the scope of their activity has been greatly increased, and already a number of them have become strong research centers. The opportunity for coöperative effort among a number of institutions carrying on allied work is excellent, and the auspicious beginning made in the diphtheria work, of the Massachusetts and Minnesota boards of health augurs well for the advantage to be derived from such joint investigations.

The facilities of American laboratories now rival many of the most famous institutions in Europe, but in matters relating to publication American work has not been as fully recognized as it ought. We now have a number of journals which are more or less distinctively bacteriological, but they are concerned more particularly with certain phases of the science, such as the relation of bacteriology to medicine. It may not be possible, but the establishment of a medium of publication that would especially embrace the activity of American work would undoubtedly be of great service in bringing a more complete knowledge of American investigations to all American workers as well as aiding greatly the bibliographical labors of foreign scientists. As it is now much of this work is reported in various journals and reports, many of which are not accessible to the great majority of other investigators. If we had in bacteriology a publication that would do for this science what the Experiment Station Record does for the American Agricultural Experiment Station, it would be invaluable. This publication is sustained by governmental aid, but it has undoubtedly been not only the means of widening the sphere of influence of American agricultural work abroad, but it has greatly aided in the development of experiment stations in this country.

It is to be hoped that the representative bacteriological societies in this country may agree on some feasible plan which will result in the consummation of this project.

FOUR YEARS' EXPERIENCE IN AN ATTEMPT TO MAKE A BACTERIAL COUNT OF 100,000 BACTERIA PER C. C., A STANDARD FOR MUNICIPAL MILK SUPPLY.

By G. W. GOLER, M. D., and F. R. EILINGER, Ph. D., Rochester, N. Y.

During 1898 and 1899 counts were made of 86 samples of milk taken from various milkmen at different seasons of the year, in the city of Rochester, N. Y.

The average count of these 86 samples showed 878,000 bacteria per c. c., 28% contained over 5,000,000, 31% under 100,000 bacteria per c. c.

In the latter part of 1899, a circular letter was sent out to all of the milk dealers supplying Rochester with milk, notifying them that after January 1st, 1900, 100,000 bacteria per c. c. would be adopted as a standard of cleanliness for Rochester's milk supply.

The following table shows the result of nearly four years' work in an attempt to maintain a bacterial standard of cleanliness for the milk supply of the city of Rochester, N. Y.

The samples are collected by means of a sterilized pipette, the upper orifice of which is closed by a plug of cotton, the lower part of the stem wound with cotton which acts as a plug for the test tube in which the sample is transported.

By means of this pipette a portion of the sample contained in the test tube is withdrawn and mixed with 99 times its volume of sterilized distilled water.

By means of a sterilized pipette one drop of this mixture is mixed with a tube of liquefied agar culture medium poured into Petri dishes and the colonies allowed to develope at room temperatures, when they are counted in the usual manner.

The number of drops required for one c. c. is determined for each pipette, and the number obtained used to calculate the number of colonies in one c. c. of the sample used:

Example No. lxxx of colonies found	24
Example No. lxxx of drops in 1 c. c	35
	120
	72
Dilution (1-100)	840
	100
Number of colonies per c. c	84000

Month.	1900.				1901.				1902.				1903.			
	Monthly averages Bacteria per c. c.	Total No. Cultures.	Over 5,000,000.	Under 100,000.	Monthly averages Bacteria per c. c.	Total No. Cultures.	Over 5,000,000.	Under 100,000.	Monthly averages Bacteria per c. c.	Total No. Cultures.	Over 5,000,000.	Under 100,000.	Monthly averages Bacteria per c. c.	Total No. Cultures.	Over 5,000,000.	Under 100,000.
January	755,971	25	5	.....	296,100	24	.....	9	191 989	48	1	17	190,272	46	.....	26
February	537,361	29	.....	.....	298,839	25	2	3	155,948	44	2	24	96,105*	40	1	26
March	189,424*	27	.....	12	176,200	24	.....	10	41,975*	47	3	27	220,812	42	2	10
April	no examinations.				402,735	24	7	4	345,609	45	2	7	163,166	45	2	28
May	820,281	35	2	12	415,504	24	.....	2	409,651*	48	3	14	189,825	47	.....	8
June	666 628	33	2	9	468,066*	23	8	3	258,136	47	5	18	280,628	43	....	2
July	426,209	33	5	8	326,285	24	4	5	232,614	46	2	5	174,151	29	3	9
August	1,571,481*	33	4	.....	325,825	24	4	3	243,558	47	4	9	362 357*	28	3	5
September	950,213	22	5	2	161,029	24	.....	11	298,996	23	2	1	209,655	29	2	4
October	891,431	34	6	6	189,461	23	.....	13	147,955	46	2	21	... .	....	.....	.....
November	548,961	24	4	1	103,959*	24	2	10	100,814	42	.....	24	.....	.....	.....	.....
December	1,408,191	24	.....	.....	195,422	24	...	9	168,789	48	.....	18	.....	....	.....	..
			16%	15%			19%	28%			6%	34%			4%	33%
Averages	796,468	319	33	50	275,827	287	28	82	215,917	581	26	185	209,552	329	13	89

*Indicates lowest and highest monthly average counts.

During the past four years more frequent inspections have been made of the stables and dairies from which the milk supply of the city is drawn, and an increasingly better condition of these places demanded.

The effect of this work, together with the establishment of municipal milk stations in charge of trained nurses during the months of July and August, has been followed by a considerable diminution in the infantile death rate. With more efficient milk inspection, an attempt to maintain a bacterial standard of milk purity and the educational work done through the municipal milk stations, from 1897 to 1902, there died from all causes in round numbers, (the total amounts to 1,620), 1,000 fewer children under one year of age, and 600 fewer children under five years of age than in the years from 1891 to 1896, with less efficient milk inspection, no attempt at a bacterial standard, and without municipal milk stations.

NOTE.—In averaging the number of bacteria per c. c., the samples containing over 5,000,000 bacteria per c. c., are not included in the average count.

THE RELEASE OF QUARANTINE IN DIPHTHERIA.

By THOMAS W. SALMON, M. D.,

Assistant Surgeon U. S. Public Health and Marine-Hospital Service, Washington, D. C.

One has only to learn the methods of releasing convalescent diphtheria patients in the different cities of the United States to find that a wider divergence of views attends the termination of quarantine in diphtheria than in any other infectious disease.

Although it is generally recognized that the patient ceases to be a source of danger when diphtheria bacilli disappear from his nose and throat, the uncertainty lies in the amount of evidence considered sufficient to demonstrate this fact.

There has been a rather exceptional opportunity for obtaining exact information on this point in the epidemic of diphtheria which has prevailed at the Willard State Hospital since June, 1899. The institution receives all classes of the insane, and has a population of over 2,200 patients, who are cared for by about 500 attendants and employes. In the management of the epidemic all persons ill with diphtheria were removed, as soon as the diagnosis was made, to an isolation hospital and there detained until cultures proved them to be free from infection.

Most of the employes remain in the institution for a considerable time and the average stay of the patients is over five years, many of them spending the rest of their lives in the hospital. This has permitted us to make the period of isolation as long as we desired without hardship to any of the persons detained, and has afforded an opportunity to observe the cases closely for a long time after their discharge from the isolation hospital. Cultures were taken at frequent intervals from the onset of the disease until many months had elapsed after quarantine was released.

A series of one hundred cases occuring after January 1, 1901, has been taken for the purpose of examining closely the period of infectiousness and the conditions which seem to modify it. Three fatal cases have been excluded. All but five were adults, the average age being 29.1 years, and the sexes nearly equally represented. Sixty-nine of the 100 cases were healthy young people employed as nurses and attendants.

The series includes cases of greatly varying severity.

The following table shows the number of days from the onset of the disease to the last positive culture:

Only one positive culture	13	cases.
1 to 5 days	9	"
5 to 10 days	6	"
10 to 15 days	17	"
15 to 20 days	16	"
20 to 25 days	10	"
25 to 30 days	6	"
30 to 35 days	6	"
35 to 40 days	5	"
40 to 45 days	2	"
45 to 50 days	3	"
50 to 55 days	1	"
More than 55 days	4	"

Before considering the cases in detail it may be interesting to notice that the severity of the disease was without influence upon the length of time the persons remained infected. The average duration of positive cultures in the severe cases was 21.86 days, in the moderately severe cases 21.4 days, and in the mild cases 22.4 days.

I have thought that it might be profitable, in considering the period of infectiousness, to apply to the one hundred cases the different methods of releasing quarantine which are in use in some cities in the United States, and to see to what extent they would have proved efficient had they been employed.

Although there are not many large cities in which the duration of quarantine is governed entirely by an arbitrary time-limit, yet in towns where bacteriological laboratories are lacking and generally in the rural districts, this is the only method for determining when the convalescent shall be released.

If all the persons in the present series of cases had been released two weeks after the onset of their illness, sixty would have been still infected with diphtheria bacilli. If three weeks had been the time-limit employed, thirty-seven persons would have been released still infected, and if four weeks, twenty-seven.

Had the absence of diphtheria bacilli in a single culture from the throat and in one taken synchronously from the nose been regarded as satisfactory evidence that the convalescents were no longer infected, fifty-four persons would have been permitted to return to their wards still infected.

The importance of taking cultures from both nose and throat is shown by the fact that in thirty-two pharyngeal cases, diphtheria bacilli were found in both nose and throat; and in twelve of these they persisted in the nose after the throat had ceased to be infected.

The following table shows the results which would have been obtained with different methods of releasing quarantine:

Time limit of two weeks	60
Time limit of three weeks	37
Time limit of four weeks	27
One negative culture	54
Two negative cultures	13
Three negative cultures	11
One negative culture after two weeks	26
Two negative cultures after two weeks	6
Three negative cultures after two weeks	5
Three negative cultures after three weeks	2
Three negative cultures after four weeks	2

The most noticeable feature is the number of times a single negative culture was followed by positive ones.

It will doubtless be agreed that a method of releasing quarantine in which a "margin" of error of from thirty to fifty per cent. exists is not at all satisfactory and should only be employed as a step toward a more perfect method or when public opinion will admit of no other. It is scarcely preferable to a time-limit.

If, then, one negative culture is entirely unsatisfactory, what may be regarded as sufficient evidence of the final disappearance of diphtheria bacilli? From its cabalistic significance, perhaps, three has been decided upon as a maximum number of negative cultures, but at Willard only two persons less were discharged still infected after three negative cultures than when two cultures taken on alternate days had proved negative. When the two negative cultures had been obtained after a time-limit of two weeks from the onset of the disease, only six persons were subsequently found to be infected.

Short of perfection, which is unattainable even when the conditions are so entirely within the physician's control as in public institutions for the insane, this measure seems to be the one attended by the fewest disadvantages and the greatest success. It introduces the obnoxious time-limit, which is unjust, in that it causes the detention of uninfected persons, and which is inefficient, in that it permits the release of many infected persons; but yet in less than two weeks few diphtheria patients can leave their rooms in safety. If two negative cultures, taken after two weeks from the onset of the disease, had been the sole requirement for the release of quarantine in the present series of cases, forty-five per cent. of all those who had had diphtheria would have regained their liberty in sixteen days and ninety-five per cent. of these with a certainty that they were no longer infected.

Several definite conclusions may be drawn from this study of one hundred cases because of the exceptional opportunity they offered for the collection of complete data.

I. The severity of the disease is shown to bear no relation to the duration of infection.

II. Additional proof is afforded of the unfairness of an arbitrary time-limit in the quarantine of diphtheria.

III. The occurrence of positive cultures after a single negative has been obtained is shown to be the rule rather than the exception.

IV. The importance of taking cultures from the nose as well as the throat for the release of pharyngeal cases is demonstrated by the number of cases in which the nose remained longer infected.

V. Two negative cultures taken on alternate days from both nose and throat after two weeks have elapsed from the onset of the disease, is suggested as a requirement which is not unfair to any and which permits the release of only six per cent. of infected persons.

REPORT OF COMMITTEE ON LABORATORY TESTS OF THE EFFICIENCY OF WATER FILTERS.

By GARDNER T. SWARTS, M.D., Chairman, Providence, R. I.

The test of any water filter or system of water purification may be separated into the field test and the laboratory test. The field test determines the mechanical or quantitative efficiency of a system of water purification, and the laboratory test indicates the chemical and biological character, also the hygienic quality of a water before and after treatment by the said system. It is obvious that field tests and laboratory tests should be contemporaneous, for the simple reasons that almost any water filter or system of purification may be operated so as to produce excellent hygienic results during certain favorable periods and at the same time fail utterly from the standpoint of engineering economics, and, on the other hand, that a system may produce an effluent which would be unfit for use, but which would be furnished at little expense. Therefore quantity, quality and cost must all be considered.

The laboratory tests of systems of water purification consist of:

(a) Sampling;
(b) Analytical work;
(c) Comparison of results with standards of excellence.

(a) SAMPLING.

1. *Bacteriological Samples.* Sampling is a most important part of the work and one should aim to have it representative. One maxim may be laid down, namely, samples should be taken so as to distribute the times of taking the same over the whole period during which the system of purification is under inspection. When slow filters are being tested this is effected as a rule by taking unfiltered water samples at twelve or twenty-four hour intervals and by taking samples of the filtered water to correspond with these. When rapid filters are being tested, this period between samples should be reduced to from four to eight hours. When the filter plant is composed of several units, occasional samples of the effluent of each of the units should be taken in addition to the samples of the combined effluents. Where a plant is tested daily one set of samples from the individual filters would probably suffice.

Occasional samples of the effluents from subsiding and coagulating basins should be taken in order to determine the relative values of each

of the elements of the system of purification. In addition to the above it is well to take samples at more frequent intervals for the first day after scraping slow filters and for the first hour after washing rapid filters. These special samples should be excluded when computing the bacterial efficiency of a system. A convenient sampling schedule for these special samples is the following:

Sample No.	Period after Scraping. Hours.	Period after Washing. Minutes.
1.	1	1
2.	3	3
3.	6	5
4.	9	10
5.	12	15
6.	18	30
7.	24	45
8.	36	60

The occasional sampling of the water used for washing rapid filters should not be omitted, because harmless forms sometimes multiply in wash water pipes and reservoirs.

Tests of water filters should be extended over several weeks or months, and when testing new works a sufficient period should be allowed for aging of the filtering material in both slow and rapid filters, that the true efficiency of the same may be shown by the results.

2. *Chemical and Microscopical Methods.* Chemical and microscopical samples should be taken in conformity with the character of the unfiltered water and their number should be determined by the analyst in charge of the test. A very good method of collection is to make up a sample of several small samples, each an aliquot portion taken at stated intervals, or better, whenever bacterial samples are taken. This sample should be distributed over the whole working day, and would therefore be fairly representative of the water of that day.

Systems of water purification are constructed with various ends in view, and as is stated above, the chemical and microscopical samples should be varied to suit the conditions. Systems of purification are designed,

(1) To remove pollution;
(2) To remove odor and its causes;
(3) To remove color;
(4) To remove turbidity;
(5) To soften water.

Where the removal of sewage pollution is the object, chemical and microscopical samples are usually of less importance than bacteriological samples, but where odor, color, turbidity or hardness are to be removed, they are much more important.

Odor is usually associated with fairly clear water and the growth of higher microscopical plants and organisms. In such cases, therefore, microscopical samples are of greatest importance.

The removal of color, turbidity and hardness can be measured by chemical means alone, and the number of samples should be determined with this fact in mind.

(b) ANALYTICAL WORK.

All samples should be analyzed as quickly after collection as is practicable. The methods of water analysis recommended by another committee of this Association should be used. In addition to these methods, the so-called "presumptive tests" for *Bacillus coli communis* recommended by Whipple* may be found very useful as an index of the general character of the samples undergoing analysis.

Complete chemical analyses of the influents and effluents of water purification systems are seldom necessary. Partial analyses, however, should be made frequently. The most important determinations under the varying conditions are as follows:

1. When the unfiltered water is polluted with sewage methods for the determination of the organic matter, (oxygen consumed, nitrogen as free ammonia, nitrates and nitrites) are of the most importance.

2. When the unfiltered water has a bad odor, due to the presence of microscopical organisms the determination of any substance which is the food or by-product of the growth of the organisms is of importance.

3. When the unfiltered water is highly colored the determination of color is obligatory. The determination of oxygen consumed may throw light upon the character of the coloring matter.

4. When the unfiltered water is turbid the removal of turbidity is measured by optical and by gravimetric methods. The former is quickly carried out and in ordinary cases needs only to be confirmed occasionally by the more tedious gravimetric method.

5. When the unfiltered water is hard. Hard waters are usually treated with chemicals and enough analytical work should be performed to record the chemical changes which take place in the water. The more important determinations are total residue on evaporation, alkalinity, incrusting constituents, chlorine, sulphates, carbon dioxide, carbonates and turbidity. Special cases, however, may require complete mineral analyses, with the determination of the alkalies.

When sulphate of alumina is applied to a water under treatment its effect on the effluent should be carefully noted. This effect may be measured by determining the alkalinity and the incrusting constitu-

* Technology Quarterly, 1903.

ents in samples of both unfiltered and filtered water. For ordinary work it is necessary only to determine that no undecomposed sulphate of alumina passes into the effluent.

In some cases it is necessary to make the unfiltered water alkaline by adding chemicals to it. The consequent chemical changes should be determined by the usual chemical methods.

(c) COMPARISON OF RESULTS WITH STANDARDS OF EXCELLENCE.

The compiled results should be subjected to criticism or comparison with specifications. These specifications are usually prepared before plants are constructed. The German Imperial Board of Health allows effluents to contain not over 100 bacteria per cubic centimetre, as determined by their methods of analysis. In this country there is a tendency towards higher standards of purification, as may be seen from the following excerpt from the specifications for rapid filters at Springfield and Jameco (Brooklyn) Long Island, New York. These filters were built between 1900 and 1903 to conform with the following requirements:

"*First*:— When the applied water contains 2,500 or more bacteria per cubic centimetre, there shall be an average reduction of bacteria in the filtered water from the whole plant in use of at least ninety-eight (98%) per cent.

"*Second*:— When the applied water contains less than 2,500 bacteria per cubic centimetre, the average number of bacteria in the filtered water from the whole plant in use shall not exceed seventy-five (75) per cubic centimetre.

"*Third*:— When the applied water contains twenty-five hundred (2,500) or more bacteria per cubic centimetre, not more than five (5%) per cent of the samples of filtered water from the whole plant in use shall show a reduction of bacteria as compared with the applied water of less than ninety per cent (90%); when the applied water contains less than twenty-five hundred (2,500) bacteria per cubic centimetre, not more than five (5%) per cent. of the samples of filtered water from the whole plant shall show more than one hundred (100) bacteria per cubic centimetre.

"*Fourth*:— When the applied water contains twenty-five hundred (2,500) or more bacteria per cubic centimetre, not more than ten (10%) per cent. of the samples of filtered water from any one filter shall show a reduction of bacteria as compared with the applied water of less than ninety (90%) per cent.; when the applied water contains less than twenty-five hundred (2,500) bacteria per cubic centimetre, not more than ten (10%) per cent. of the samples of filtered water

from any one filter shall show more than seventy-five (75) bacteria per cubic centimetre.

"*Fifth*:— Not more than five (5%) per cent. of the samples of filtered water from the whole plant in use shall show a reduction of microscopic organisms, determined as standard units, of less than ninety-eight (98%) per cent. as compared with those in the applied water.

"*Sixth*:— The filtered water shall contain no undecomposed coagulant, and no more iron or aluminum than the applied water; it shall not show an acid reaction, nor an alkalinity greater than that of the applied water."

This degree of purification is demanded of filters built of wood. More modern filters of this type are now usually built of concrete, and moreover, are fitted with appliances which tend to increase the hygienic efficiency of the plants to such a degree that it does not seem unreasonable to hope, with plants to be constructed in the future, that when the applied water contains less than 2,500 bacteria per cubic centimetre, the average number of bacteria in the filtered water from the whole plant will not exceed 50 per cubic centimetre. The degree of removal of *Bacillus coli communis* by systems of purification is of course an index of its efficiency, but it does not seem possible at this time to give numerical limits for the permissible number of these organisms. Their presence in the effluent in considerable numbers is to be regarded with suspicion.

Your committee does not feel that any system of water purification is satisfactory unless the appearance of the effluent is satisfactory to the great majority of the consumers., A public water supply of unsatisfactory appearance tends to increase the use of water from springs and other sources. These miscellaneous waters may be of good appearance, but may also be of very bad quality from a hygienic standpoint. The establishment of water purification plants, which can not produce effluents of good appearance should be deplored.

Experience with plants in practice leads one to believe that either slow or rapid filters, may be operated to obtain equally efficient hygienic results. Published reports showing a bacterial efficiency of over 99 per cent. have been obtained both at Albany, N. Y. where slow filters are in use, and at Little Falls, N. J., where rapid filters have been put into service. Experience with filters of both types teaches that better results may be expected from large plants in practice than from the smaller experimental plants at the various state and municipal testing stations.

HOUSEHOLD FILTERS.

The varieties and the number of mechanical devices for the filtration of drinking water in the household, or at the place of consumption, is so large that a reasonable survey or classification of them is impossible.

Three principles may be recognized as embodied in different filters.

Simple filtration.

Preliminary treatment and filtration.

A certain amount of treatment during filtration.

The two latter are less used at present and most makers of filters depend upon simple filtration for their claims.

Filters are of two kinds according to manner of operation.

Gravity filters.

Pressure filters.

The pressure filters must of necessity be more dense than the gravity filters.

A household filter stands immediately between the individual and the possibility of infection. It must therefore certainly stop the further progress of pathogenic bacteria. Germ proof must be a limited term: either micro-organisms pass through with the water or they do not. It would seem that a certain density of material is necessary to prevent their passage and from this density no wide variation is possible. If the openings are increased bacteria will pass, if they are decreased the apparatus fails to filter. Considered from the standpoint of their relation to the openings in such media the general size of bacterial cells is approximately the same; that is their diameter is .3 to 1. μ

The density of a suitable filter medium must therefore be such that the openings are less than this size. The required density to withstand the passage of bacteria is such that without pressure the filtration is extremely slow. Gravity filters that give satisfaction as to the amount of water filtered are more porous than the limits of porosity for a germ proof medium. In general this gravity method for procuring pure water is uncertain and unsatisfactory.

AS REGARDS THE TEST.

Bacillus prodigiosus or *Bacillus violaceus* are most suitable.

Must be applied long enough to prove the case.

The filtered water must be tested at once.

The test bacterium must not be lost in the test.

The number found in the filtered water should be conclusive.

Special sterilization of a new apparatus is not necessary.

GROWING THROUGH TEST.

The application of the test organism should be nearly continuous.

Operation should be maintained as in actual use.

If the test bacterium does not pass, the raw water side should be examined for numbers of test organisms present.

The temperature should be within the range of that of utility.

Suspended matter in the raw water may make a difference in the operation as the medium will be clogged more quickly.

CONDITIONS RENDERING THE TEST MORE ACCURATE.

The test bacterium should be suspended in water rather than bouillon.

The test bacterium should be in such numbers as to be readily detected.

It should be applied as evenly as possible.

Preliminary cultivation from the filtered water and identification cultures from this is the most certain way of recovering the test bacterium.

Note:— In some instances direct indentification cultivation can be made.

RELIABILITY OF TESTS.

The single test should be accurate. There is no reason for it to be otherwise.

One test will not do for a class or for a particular kind of apparatus.

Each filter should be tested.

EFFICIENCY CONDITIONS.

The apparatus must be simple in construction.

It must be easily and completely taken apart.

The filtered water chamber must be protected when the filter medium is removed.

Rubber connections if used, must be entirely removable.

Flows and leaks can be shown by compressed air test.

Filter medium must filter evenly.

Filter medium must withstand heat necessary to sterilize.

Bacteria test with known species must show complete removal of test organism.

Growing through test must show efficiency for 30 days at temperature and pressure of actual operation.

THE EFFECT OF LEMON JUICE IN THE MIXTURE KNOWN AS LEMONADE UPON TYPHOID POLLUTED WATER.

By WILLIAM G. BISSELL, M. D., Buffalo, N. Y.

The investigation which I report was prompted by a newspaper statement purporting to come from the health department connected with one of the leading municipalities of the United States, that the amount of lemon juice ordinarily contained in the mixture known as lemonade was sufficient to render inert any typhoid bacilli that might be contained in such mixture, and that waters contaminated with typhoid were safe to drink when made into such a beverage. The investigation was carried on, using three distinct methods for testing and the results were confirmed by a duplication of each test.

METHOD I.

In an ordinary glass of sterilized distilled water there was placed the strained juice of one-half a large lemon. This mixture, as shown by tests, was as strong as any that would ordinarily constitute a pleasing beverage of this character. In this mixture there was introduced one c. c. of a forty-eight hour old broth culture of typhoid bacilli.

After the elapse of periods of five, ten, fifteen, twenty, twenty-five and thirty minutes respectively, one c. c. of the lemonade-typhoid mixture was introduced in each of three tubes of plain agar, lactose litmus agar, gelatin, and plain broth.

All tubes, with the exception of those of gelatin were placed at an incubating temperature of body heat. After twenty-four hours there was distinct cloudiness in most of the bouillon tubes, with the exception of one five minute tube, two of the fifteen minute tubes and two of the thirty minute tubes. These tubes failed to reveal growth.

One fifteen minute lactose litmus agar tube and one gelatin tube failed to reveal growth. It appeared to the writer that the failure to get growth in the instances stated was not due to the fact of the organism being destroyed by the germicidal action of the lemon juice, but because the presence of the small amount of free acid in the culture medium had inhibited growth. In order to ascertain if this view was correct, culture medium prepared and after sterilization minute quantities of lemon juice ranging from one-twentieth of a c. c to one-half of a c. c. were introduced into each ten c. c. of the medium.

Such tubes were inoculated with typhoid bacilli. In about thirty-two per cent. of the instances the typhoid organism failed to grow. Check cultures of the same medium without the addition of lemon juice revealed decided growth in each instance. It seems fair to assume that Method I as determining the germicidal action of this strength of lemonade to the typhoid organisms is not reliable. In view of these circumstances the second method was tried.

METHOD II.

In this method, forty-eight hour broth cultures of typhoid bacilli were prepared, and into each culture there was introduced a sterilized glass rod. After a few minutes' immersion the rods were removed and placed in individual sterilized test tubes, so that any material adhering to the rod would become dry. A lemonade mixture similar to that used in Method I was prepared, using the same proportions of lemon juice and water but omitting the typhoid culture.

The typhoid infected rods were placed in the mixture and after the elapse of periods of five, ten, fifteen, twenty, twenty-five, thirty, forty, and fifty minutes, the rods were removed and placed in different tubes containing ten c. c. each of sterilized distilled water. The object of this procedure was to remove any of the lemon juice that might be present. After being thoroughly washed in the water the rods were introduced into ordinary culture broth. After twenty-four hours at the incubating temperature there was not a single failure to obtain growth. In order to substantiate this result the third method was tried.

METHOD III.

Sterilized silk threads were saturated in a forty-eight hour old culture of typhoid bacilli and these threads allowed to dry. All threads were placed in the lemon mixture and after twelve hours immersion were placed in sterilized distilled water. After being washed in the water the threads were placed in culture broth. In not one instance, covering tests of twenty-three threads, was there failure to obtain growth in the culture broth.

From the results obtained the following conclusions would seem justifiable.

First. That lemon juice in the proportion given has not a decided germicidal action upon typhoid bacilli.

Second. That this method of treating water to prevent a possible typhoid infection should be discouraged.

ABSTRACT OF A PAPER ENTITLED "A CRITICAL STUDY OF THE METHODS IN CURRENT USE FOR THE DETERMINATION OF FREE AND ALBUMINOID AMMONIA IN SEWAGE."

By EARLE B. PHELPS, Boston, Mass.

The work here presented is the first part of a study which will eventually cover the whole field of sewage analysis. It aims to show what accuracy may be expected from the various processes now employed in sewage analysis, and what modifications, if any, will make them more applicable to the problems of sewage disposal.

THE FREE AMMONIA.

All free and saline ammonia is recovered quantitatively in the distillate. Many proteids and other nitrogenous substances give off ammonia when distilled with sodium carbonate, introducing a serious error in the analysis. This error is greatly increased in the case of sewage owing to the unstable nature of many of its compounds. A method for the direct reading of the ammonia is suggested. In the process of Nesslerization, the error due to temperature and other minor errors are discussed.

THE ALBUMINOID AMMONIA.

The ratio of the albuminoid nitrogen to the total nitrogen is determined for a number of pure substances and for a large number of sewages. These ratios show wide variations not only among the various substances but among the sewages themselves.

Owing to these variations, which seem to depend upon the nature of the substances in the sewage and not upon the amount of organic matter present, it is strongly recommended that the present method of determining the albuminoid ammonia be given up in favor of a determination of the total organic nitrogen by the Kjeldahl process, a simple and rapid modification of which is proposed for use in sewage work.

ABSTRACT OF A PAPER ENTITLED "A DANGEROUS FOOD-PRESERVATIVE."

By CHARLES HARRINGTON, M. D., Boston, Mass.

Sodium sulphite is used very extensively as a food-preservative, and, more particularly, for its effect on the color of chopped meat (Hamburg steak) and certain canned vegetables (asparagus and corn). The assertion made in 1896 by Kionka that it is a dangerous admixture has been combatted by a number of experimenters and reaffirmed by Kionka and Schultz. Dogs fed on meat containing 0.20% of the salt were found by them to present extensive lesions in almost every organ, while others fed in the same way by Lebbin and Kallmann showed nothing abnormal.

In this experiment, five cats were fed for five months on beef containing 0.20% and a sixth one with untreated beef. All six began at once to gain in weight, but at about the ninth week all but the control began to lose and they continued to do so up to the twentieth week, when all were killed. The organs of the control were normal. The chief lesion observed in the others was a parenchymatous degeneration of the kidneys. Each of the five presented cloudy swelling and marked fatty degeneration of the renal epithelium. Acute interstitial nephritis was present in addition in one case.

REPORT OF THE COMMITTEE ON THE SIGNIFICANCE OF B. COLI IN WATER SUPPLIES.

By S. C. PRESCOTT, Boston, Mass.

Owing to the fact that the meeting of the Association takes place several weeks earlier than was anticipated by the Committee the report here presented is somewhat incomplete, and may perhaps be regarded merely as a report of progress.

It was the intention of the committee to present in this report a digest of all work done during the past year upon the significance of *B. coli* in water supplies, so far as the results of such work were available, but for the reason above stated this has not been possible. It may be said, however, that during the past year a number of papers of interest have appeared. Winslow and Miss Hunnewell have made a study of the distribution of *B. coli* in polluted and unpolluted waters, finding the organism constantly present in the former and absent or in very small numbers in the latter. Their findings are summed up in the following paragraph.

"These experiments show that by the method employed (preliminary fermentation with dextrose broth) and subsequent isolation and identification, *B. coli* is very rarely found in one cubic centimeter samples of polluted waters. In 157 samples typical colon bacilli only appeared five times, and paracolon organisms five time more. This confirms the observation of Smith and the English bacteriologists as to the parallelism existing between the number of colon bacilli present in a water and the extent of its contamination."

These results have been confirmed by Winslow and Nibecker, in a more extended research, in which a number of methods of isolation were employed.

Several investigators, notably Papasotiriu, have confirmed the results discussed at the last meeting of this section as to the occurrence of colon bacilli on cereals, etc.

Another notable paper which bears directly upon the significance of *B. coli* in water has been contributed by G. A. Johnson who has investigated the occurrence of *B. coli* in the ailmentary tract of fish He reports the examination of the stomachs and intestines of 67 fish of 15 species caught from the obviously polluted Mississippi and Illinois rivers. From 47 of them *B. coli* was isolated; in twenty-four cases from the stomach and in forty-one cases from the intestine.

"The cultures giving the following reactions were judged to be *B. coli communis:*

"Bacillus — true form, obtained in three-day agar culture.

"Motility in two-day broth culture.

"Broth rendered turbid.

"Gelatin tube, luxuriant growth along the entire path of the needle, without liquefaction of the gelatin.

"Fermentation of dextrose broth with a total gas production of from 25-75 per cent. Ratio of H to CO_2 approximately 2:1.

"Indol produced.

"Nitrate reduced to nitrite.

"Milk coagulated without liquefaction of the casein; litmus reddened.

"Fecal odor of growth in broth and agar cultures, respectively.

"All the above tests, except where specifically stated, were made after ten days incubation at body temperature." * * * "It has been shown that a search of a large number of fish caught in an unpolluted water failed to reveal the presence of this organism in the intestinal tract. It would seem possible, therefore, that fish, having taken up the colon bacillus from a polluted water might migrate to a water of comparative purity where they would naturally discharge the greatly increased number of these organisms.

"Whether the finding of the colon bacillus in a water in this manner would depreciate the value of the colon test in the examination of a public water supply is a question. It would certainly appear that if the colon bacillus can be thus easily transferred from one water to another, the transportation of the typhoid bacillus may be considered quite as likely. At least the above results may explain the apparent phenomenon frequently noted when *B. coli communis* is found in comparatively large numbers in waters apparently open to but remote chances for fecal contamination."

The committee wishes also to call attention at this time to the paper on the "Value of Tests for Bacteria of Specific Types as an Index of Pollution" by Messrs. Clark and Gage which will be reported at this meeting, and which cannot fail to be of value since its conclusions are based upon the results of several thousand colon determinations.

In order to present a statement of the opinion of the committee individually and as a whole as probably representing the generally accepted views of sanitary bacteriologists as to the significance of *B. coli* in water the following questions were sent to each member.

The answers appended, except as otherwise stated, were practically as given below.

1. In view of the fact that numerous investigators have found *B. coli* in nature where it could not be directly traced to sewage or fecal pollution do you believe that the colon test of water is as safe an index of pollution as it was formerly regarded to be? Yes.

2. Are you of the opinion that the number of colon bacilli rather than their presence should be used as a criterion of recent sewage pollution? Yes.

3. In order to pronounce a water sewage-polluted would you require as evidence that *B. coli* was present in a majority of one cubic centimeter samples? Yes, in general.

4. Are you in favor of recommending that the examination of large samples for *B. coli,* 100-1000 cc. be discouraged? Four members say Yes in reply, one says No.

5. In case of a strong presumptive test what confirmation tests would you require to make certain that the organisms present were *B. coli?* Full set of distinctive cultured tests.

6. In view of the probable presence of streptococci in polluted waters do you think it desirable that they be isolated as well as *B. coli* to confirm suspicious evidence of pollution offered by *B. coli?* Two would not recommend this; one thinks it would be advantageous occasionally, but not practicable because of increase in routine work; one believes it should be done when possible, for the sake of securing additional data, and for its general confirmation of the colon test; and one is indefinite.

A SIMPLE METHOD FOR THE ROUTINE DETECTION OF THE COLON BACILLUS IN WATER.

By WM. ROYAL STOKES, M. D., Baltimore, Md.

This paper proposes the use of neutral red in a fermentation tube containing one per cent. lactose or milk sugar bouillon, for the routine detection of colon bacilli in drinking water.

The work of Theobald Smith has shown that the colon bacillus ferments lactose with the production of from thirty to fifty per cent. of gas, that the medium is acidulated, and that the proportion of gas is usually that of one part of carbon dioxide to two of hydrogen. Jordan studied a large number of bacteria isolated from various rivers, and did not find any fermentative bacteria which carried out all of the phenomena in the lactose fermentation tube which is characteristic of the colon bacillus. The writer also isolated a moderate number of fermentative bacteria from the Baltimore water supply, and failed to find any fermentative bacteria exactly resembling the colon bacilli in lactose bouillon in the fermentation tube.

In addition to the above characteristics of the colon bacillus in lactose bouillon this organism causes a characteristic color reaction when neutral red is added to the solution in the proportion of 10 c. c. of a 0.5% solution to 1 liter. This has been partly described by Irons and others, but they use the test in an ordinary test tube.

When used in the fermentation tube the open bulb remains a port wine red color, and the closed bulb turns a light canary yellow, often showing fluorescence. The curved stem joining the closed and open bulbs shows an abrupt contrast of the colors usually in the middle of the curve. The members of the proteus and cloacae group usually turn both bulbs yellow, but not always.

The method recommended is to inoculate a fermentation tube containing 1% lactose neutral red in the routine examination of water. If the percentage and amount of gas, the acidity, and the typical yellow-red contrast reaction all occur the organism can be considered as *Bacillus coli communis*. This is a much shorter method than the isolation in pure culture which takes from five to seven days, and will also make it much easier to carry out quantitative experiments. These four distinct characteristics would seem to be sufficient to identify the colon bacillus in simple routine work.

THE BACTERIAL EXAMINATION OF 104 SAMPLES OF WATER TOGETHER WITH A DETAILED STUDY OF THE COLON BACILLUS.

By WILLIAM G. BISSELL, M. D., Buffalo, N. Y.

There is not a subject at the present time, that is shrouded with a greater uncertainty than the sanitary interpretation of the presence of *Bacillus coli* in a water supply. This uncertainty has been largely augmented by the fact that many reliable observers have found colon bacilli in waters, which presumably were not polluted with fecal material.

At the last meeting of the American Public Health Association, after considerable consultation between many of the laboratory workers, it was decided that several should conduct, independently, an investigation along the following lines.

First. The consideration of what should constitute a colon bacillus.

Second. The amount of water most advisable to test in order to arrive at some conservative conclusion, as indicating the presence or absence of fecal pollution.

Third. The length of life of the colon bacillus in water under its natural environment.

Fourth. The degree of frequency with which colon bacilli can be found in different amounts of water known to contain sewage.

Fifth. To ascertain, if possible, the relative degree of frequency with which colon bacilli can be detected in water presumably not polluted with sewage.

After considering the subject, it appealed to the writer that his residential district was most fortunate, in that it afforded a favorable field for an investigation of this character and after obtaining the cooperation of an able laboratory assistant, who could devote his entire time to the work, an investigation was started.

During the progress of the work some difficulties were experienced, and particularly was this true, in considering the fifth division of the work, for the reasons, that although many wells were found which, upon investigation did not reveal the probable access of fecal pollution, it was impossible to locate but one body of water (Lake Hemlock, near Rochester) where sewage pollution could be presumably eliminated.

The first division of the work, as to what constitutes a colon bacillus was conducted along the following lines.

First. An organism responding to the full colon test was isolated from fifteen different samples of human feces. These organisms were cultured in all the common media and in different lots of the same media and the comparative results checked. It was found that the same organism in the same class of media, but of different generations, (and particularly was this true in regard to the use of the Smith fermentation tube), would frequently differ as to the amount of gas produced during a definite interval. In two instances organisms giving indol and odor reactions in older generations would fail in different lots of the same class of media in earlier generations. It was the writer's endeavor by this procedure to ascertain as near as possible, the actual degree of uniformity of results that it was possible to obtain with the present colon test.

The second factor. In ascertaining what constitutes a colon bacillus, was the study of certain lactic acid producing organisms and their comparison with known colon bacilli. Many of the members of this Section will recall that Prescott has pointed out a great similiarity between certain lactic acid organisms found upon grain and the colon organism.

The writer at the last meeting of the American Public Health Association exhibited cultures showing the similarity in the cultural manifestations between the *Bacillus acidi lactici* of Hoeppe and the colon bacillus. The work in this connection was conducted as follows:

Fifteen different laboratories were communicated with and cultures purported to be lactic acid bacilli were received. After thorough cultural investigation it was impossible by any of the usual methods to demonstrate a constant difference between ten of the cultures received and the colon bacilli. These results at first puzzled the investigators, for it suggested the possibility of the lactic acid organism not being a distinct species of the bacteria. It is now the writer's belief that such cultures were none other than the colon bacillus mistaken for the lactic acid organism, for the reason that the remaining five cultures contained an organism absolutely non-motile, nor was it possible, under different modes of procedure to cause these organisms to develop motility and in that manner differed from the colon bacillus. It is the writer's opinion that such cultures were true lactic acid bacilli and this has been recently strengthened by the positive demonstration of spores in four of the five cultures.

The third section of the work. As to what should constitute a colon bacillus was devoted to the use of presumptive tests. This work was carried on to ascertain to what degree it was necessary to carry on confirmative work, in order to arrive at a positive diagnosis where a presumptive test was most marked. The organisms tested were two

common to most water, namely the *Bacillus fluorescens liquefaciens* and the *Bacillus fluorescens putidus*. All results were checked with cultures of colon bacilli.

The presumptive test included the use of three fermentation tubes containing two per cent dextrose bouillon and the subsequent testing of gas formulae after forty-eight hours, the production of acidity, the coagulation of milk, the production of indol and the production of a disagreeable odor. It was found that the organisms mentioned gave results that could be easily mistaken for colon bacilli, if no greater time than forty-eight hours be allowed and the exact morphology of the organisms not determined.

The result of this division's work seems to justify the following conclusions:

(A) That the factors liable to great variation in tests for colon bacilli are those pertaining to the amount of gas produced, the production of indol and the production of a putrefactive odor.

(B) That it is necessary in order to arrive at a positive diagnosis of colon in water to completely culture the organism and the results obtained include the following:

(1) A motile organism.

(2) Slender rods without spores.

(3) An acid producing organism.

(4) One that will coagulate milk without a re-digestion of the casein within forty-eight hours.

(5) An organism producing marked turbidity in broth within forty-eight hours.

(6) An organism capable of fermenting two per cent dextrose bouillon in a Smith fermenting tube giving 25% to 75% gas production within forty-eight hours. The gas having an approximately formulae of two parts hydrogen to one part carbon dioxide.

(7) The production of indol.

(8) The reduction of nitrates to nitrites.

(9) The production of a putrefactive odor.

(10) An organism that will ferment lactose and saccharose as well as dextrose.

(C) That there are other organisms common to water, which may be easily mistaken for colon bacilli if presumptive tests are alone considered.

The second division of the work as to the amount of water advisable to test, in order to indicate the presence or absence of fecal pollution, was conducted as follows:

Buffalo, a city of 400,000 inhabitants is situated at the head of Niagara River. This river has an average velocity of nine miles per

hour and a volume of gallons per square foot of space. The sewage of Buffalo is emptied into this river and in consequence of its being a turbulent stream becomes mixed with the water of the river in a very short distance. It appealed to the writer that examination of different amounts of the water at distances of twelve and twenty-two miles down stream would be productive of much valuable information, as regards the amount of water advisable to test, as this river certainly received a tremendous amount of direct sewage pollution.

The investigation covered an examination of 104 samples. Fifty-two of these samples were collected twelve miles below Buffalo and the remaining fifty-two samples ten miles below this point, or twenty-two miles down stream. All samples were examined in quantities ranging from one-tenth of a c.c. to one liter.

The results obtained were as follows. From the samples collected twelve miles down stream colon bacilli were present in.

21% when 1/10 of a c.c. was the amount examined.
29% when 1/2 of a c.c. was the amount examined.
52% when 1 c.c. was the amount examined.
59% when 5 c.c. was the amount examined.
69% when 10 c.c. was the amount examined.
80% when 50 c.c. was the amount examined.
87% when 100 c.c. was the amount examined.
90% when 500 c.c. was the amount examined.
91% when 1 liter was the amount examined.

Of the samples collected twenty-two miles down stream the results were as follows:

19% when the amount examined was 1/10 of a c.c.
21% when the amount examined was 1/2 of a c.c.
34% when the amount examined was 1 c.c.
39% when the amount examined was 5 c.c.
41% when the amount examined was 10 c.c.
47% when the amount examined was 50 c.c.
51% plus when the amount examined was 100 c.c.
53% when the amount examined was 50 c.c.
59% plus when the amount examined was 1 liter.

There were several doubtful results during the progress of the work and all such results were recorded as being positive.

In several instances if the presumptive test mentioned in division No. 1 was alone considered as being conclusive evidence of the presence of colon bacilli many errors would have resulted and a much larger percentage of positive results recorded. The result of this work corresponds with similar work conducted by Winslow and Miss Hunnewell. It is the writer's belief that the relative frequency of colon

bacilli in a given quantity of water is largely dependent upon the amount of dilution that the raw sewage or fecal material undergoes. It will be noted that the results at twelve and twenty-two miles show a considerable variance in favor of colon bacilli being less frequently found in the same amounts of water at the greater distance. The cause of this decrease does not seem easy of explanation, for the reason that the natural influences which tend to produce disintregration of organisms as worked out and recorded by Jordan, do not seem to be present in this clear, shallow, rapidly running, stream having a bed largely composed of rock.

Agitation would not seem accountable for the result, for the reason that samples collected immediately above and below Niagara Falls failed to reveal any difference in the number of organisms present. It would seem to the writer that sunlight is the only remaining natural factor that could possibly be considered and the reduction may be due to this cause. The land on either side of the Niagara River is subject to constant cultivation and as many of these samples were taken during and following heavy rainfalls, it would seem if the cultivation of lands in the near vicinity, supplies any great amount of colon bacilli to a stream of this character, that the relative numbers of coli would have been materially increased at such times. As a matter of fact, this was not the investigator's experience. The number of coli present in the amount of water was materially lessened following rainfalls. This of course might be due to the great dilution produced by the rainfall. As judged by the investigators the relative amount of colon supplied, if any, must have been extremely small, to permit of the reductions noted. As a recapitulation of the results of the second division's work the following conclusions would seem justifiable.

(1) The presence of colon bacilli in the majority of 10 c.c. lots of a sample should be looked upon as suspicious.

(2) When found in the majority of 5 c.c. lots of a sample, it should be looked upon as decidedly suspicious.

(3) When found in 50% of 1 c.c. lots of a sample it can be considered as positive evidence of direct fecal pollution.

(4) That whereas cultivated lands bordering on water supplies may furnish sufficient quantities of colon bacilli during rainy periods to permit of their being detected when large quanties of water are examined, it does not appear that in the examination of 1 c.c. amounts of samples that colon bacilli coming from this source will be present in sufficient numbers to permit of their detection in the majority of the 1 c.c. examinations.

The third division of the work, the length of life of the colon bacillus in water under natural environment was conducted as follows:

Three wells were found, which after thorough inspection of the surrounding territory and careful bacterial examination did not reveal colon bacilli. There was placed in each well one quart of excrement, the source of same being as follows:

Human in well A., cow in well B. and horse in well C.

After ten days all wells were examined and colon bacilli were found in abundance, the exact number being in the neighborhood of:

Well A. 500 to 800 per c.c.

Well B. Over 3,000 per c.c.

Well C. Over 1,000 per c.c.

After thirty days the number of colon in well A. were approximately the same; in well B. the colon had decreased; in well C, the colon had decreased 10%. After ninety days the number of colon bacilli in well A. had decreased over 11%; in well B. could be found only occasionally in c.c. quantities, and in well C. there were but an average of four colonies of colon bacilli to the c.c. counting four plates. It was impossible at this time to continue the investigation of wells B. and C. but an examination of well A. 190 days after the introduction of excrement revealed five colonies of colon bacilli per c.c. averaging three lactose litmus agar plate. From these tests it would seem that the length of life of colon bacillus in well water under natural conditions varies with the variety. It was impossible to conduct an investigation relative to the length of life of colon bacilli in stream water. The following recapitulation of results would seem justifiable.

First. The resistance of the colon bacillus in water is influenced by the animal source of the material.

Second. That there is a gradual decrease in the number of organisms where there is no additional pollution.

Third. That colon bacilli in human excrement is capable of surviving at least 190 days in well water.

The fourth division of the work, that of considering the degree of frequency with which colon bacilli can be found in water known to be polluted with sewage is covered under the results reported in the work of the second division.

The fifth division of work, the degree of frequency with which colon bacilli can be found in waters not presumably contaminated with fecal material was conducted as follows:

The work of this division was mostly confined to the examination of well waters, for the reason that after a most diligent search the investigators were unable to locate a single stream and but one lake

(Hemlock, near Rochester), from which, the presence of sewage could be presumably eliminated. The source of this lake it reported to be springs and it is not directly connected with any other great body of water. The great distance of this lake from the point where the work was being conducted rendered it impossible to obtain any great number of samples for investigation.

Seven samples were examined, all being collected upon the same day, at different locations in the lake and fortunately at a time following a forty-eight hour rainfall. The land surrounding Lake Hemlock, for a considerable distance is controlled by the city of Rochester and is protected as a watershed to this lake. The remaining adjacent lands are used for farming purposes.

After many attempts using 1, 3, 5, and 10 c.c. lots from each of the seven samples, it was impossible to detect the presence of colon bacilli. The well water tests included, on an average, four examinations of two different samples from thirty-one different wells. Five c.c. was the amount selected in each instance. None of the examinations revealed the presence of colon bacilli.

A recapitulation of the results of the five divisions of work seems to justify the following conclusions.

First. That there is a difference between the *Bacillus acidi lactici* of Hoeppe and the colon bacillus.

Second. That presumptive tests may be of value as primary procedures, but must not be relied upon, in arriving at a positive diagnosis of the colon bacillus.

Third. That the colon bacillus cannot be constantly detected in c.c. amounts of water from the same source, although it may be heavily polluted with sewage.

Fourth. That the presence of colon in 50% of c.c. amounts of water is strongly indicative of sewage pollution.

Fifth. That the ordinary cultivation of farm lands although it may be the source of some colon bacilli to a water supply does not seem to play any great role as such and that this source need hardly be considered when the majority of 1 c.c. samples reveal the organism.

Sixth. That agitation has little or no destructive influence upon colon bacilli in water and that light appears to exert a destructive influence.

Seventh. That the positive detection of the presence of true colon bacilli in waters not presumably receiving sewage is rare.

Eighth. That it is possible there have been organisms mistaken for colon bacilli, probably through too great reliance upon presumptive tests.

A DIFFERENTIAL TEST FOR TYPHOID AND COLON BACILLI.

By F. C. HARRISON, Guelph, Ont.

The colourless growth of the typhoid bacillus on potato is a time honoured test of much value, the writer has also used a medium which may be called a potato broth which has also given excellent differential results.

This broth may be prepared by cutting a medium sized potato into pieces, covering with water and boiling for fifteen to twenty minutes until the volume of water is about 150 c.c. This broth is then filtered, and the filtrate, which is fairly clear, is run into test tubes and sterilized by the ordinary methods.

The typhoid bacillus when grown in this broth produces a uniform turbidity with no pellicle formation (three days at 37°). The bacilli are somewhat long and narrow.

On the other hand, the colon bacillus when grown in the broth produces a *pellicle* in from fourteen to thirty-six hours at 37° C. and a heavy turbidity; sometimes the fluid becomes milky.

The writer has tested this method with typhoid and colon bacilli from the following sources:

TYPHOID BACILLUS.

Funck 1. No pellicle (3 days at 37°) uniformly turbid.
Funck 2. No pellicle (3 days at 37°) uniformly turbid.
Krael. No pellicle (3 days at 37°) uniformly turbid.
Zurich. No pellicle (3 days at 37°) uniformly turbid.
Kingston, Ont. No pellicle (3 days at 37°) uniformly turbid.

COLON BACILLUS.

1. (Typical.) From case of cystitis — Pellicle in 14 hours at 37°; milky and turbid.

2. (Typical.) From case of cholecystitis — Pellicle in 24 hours at 37°; milky and turbid.

3. (Typical.) From human fæces — Pellicle in 24 hours at 37°; very turbid.

4. (Immotile.) From urine — Pellicle in 24 hours at 37°; very turbid.

5. (No gas in glucose.) From urine — Pellicle in 28 hours at 37°; very turbid.

6. (No indol) From fæces — Pellicle in 36 hours at 37°; very turbid.

It is possible that this method will not furnish such good results with other varieties of typhoid and colon bacilli, but the writer would like to see if this test would give similar results when tried by other investigators.

ON SOME CULTURAL RELATIONS AND ANTAGONISMS OF BACILLUS COLI AND HOUSTON'S SEWAGE STREPTOCOCCI; WITH A METHOD FOR THE DETECTION AND SEPARATION OF THESE MICRO-ORGANISMS IN POLLUTED WATERS.

S. C. PRESCOTT AND S. K. BAKER.

(From the Biological Laboratories, Massachusetts Institute of Technology, Boston.)

It is generally believed that the occurrence of B. coli in considerable numbers in water supplies is an indication of fecal pollution and renders the water unsuitable for drinking purposes. The opinion that this organism is characteristic of pollution from human sources was long since proved to be erroneous, as it was shown by Dyar and Keith (1), Smith (2), Flint (2A), Belitzer (3), and Moore and Wright (4), to be constantly present in the intestines of many groups of animals. More recently a number of investigators in Europe and America have reported that bacilli behaving in all respects like the colon bacillus of the human intestines are frequently found in nature where there is no evidence of direct or immediate fecal pollution. Kruse (5) and Weissenfeld (6) declared that B. coli is present in almost all waters, good or bad. One of us (7, 8) has isolated from grains and products of milling a considerable number of organisms having all the characteristics of B. coli, and Papasotiriu (9) obtained the same results in Europe in an investigation of similar scope. Other workers have also published results which lead to the conclusion that bacteria corresponding in every way to B. coli are by no means confined even to animal intestines, but are widely distributed in nature. While this fact has not destroyed altogether the value of the "colon test" for potable waters, it has made it clear that extreme care should be used in interpreting the results thereby obtained, as has already been pointed out by Freudenreich (10), Smith (11), and one of us (12); and it has also led to a belief in some quarters that, if possible, confirmatory evidence of some sort should be adduced whereby the bacteriologist may establish beyond doubt recent intestinal pollution.

Such a means of confirmation seems to be offered by the streptococci of Houston, which have been shown by various workers to be present in sewage, sewage effluents, and polluted waters, and in soil which has received the wastes of animal life, but to be absent from un-

polluted waters and virgin soils. Originally reported by Laws and Andrewes (12) in 1894, the importance of these micro-organisms was not emphasized until 1899 and 1900, when Houston (13) laid special stress upon the fact that streptococci and staphylococci seem to be characteristic of sewage and animal waste, the former being, in his opinion, the more truly indicative of recent pollution. Horrocks (14) found these organisms in great abundance in sewage, and in waters known to be polluted but which contained no traces of B. coli. He found by experiment that B. coli gradually disappeared from many specimens of sewage kept in the dark at the temperature of an outside veranda. But the commonest forms which persisted were varieties of streptococci and staphylococci.

The first investigators in this country to call attention to these streptococci were Winslow and Miss Hunnewell (15) in 1901. They first observed them in the washings from the hands of school children, and have since isolated them from crude sewage and from many polluted waters. They found that in Smith fermentation tubes "dextrose-fermenting organisms, which the immediate inoculation of the dextrose broth showed to be present . . . in forty-eight samples, disappeared in forty-four cases during the two incubations of twenty-four hours each." On analysis, the persisting organisms were found to be streptococci or staphylococci which had overgrown or killed out the colon bacilli in nearly every case. In only three out of 157 samples of unpolluted waters, however, did they find streptococci when 1 c. c. of the water was examined.

A note by one of the present writers (16) in 1902 set forth the difficulty of making pure cultures of B. coli from inoculations of dextrose broth with fecal matter, if the incubation is carried too far. It was found that other organisms, especially streptococci, develop abundantly and overgrow the colon bacilli, which are present in chief during the period of gas-formation.

Gage (17), at the Lawrence Experiment Station, has reported the streptococci present in the sewage of that city, while Le Gros (18), in a recently published monograph describes many streptococci, all isolated either from the body or from sewage. It seems, indeed, from all existing evidence, that the streptococci are, as a class, closely associated with animal bodies, occurring either on the surface or within the intestinal tract. It seems reasonable, therefore, to regard these organisms as indicative of recent pollution, as suggested by Houston.

Since, as we now know, B. coli is widespread in nature, it may perhaps be present in considerable numbers in waters otherwise unobjectionable, although we have as yet no proof of this possibility. It is also conceivable that streptococci may be found in pure water, though

all evidence at the present time seems to render this improbable. But it is at present very unlikely that both forms will occur abundantly at the same time in any unpolluted waters, while, on the other hand, we know that both are abundant in sewage. It will therefore obviously be of advantage in judging the quality of a water if the presence of both kinds of bacteria can be demonstrated in it.

With this end in view we have recognized the desirability of examining waters for both colon bacilli and streptococci, and have attempted to devise a method whereby this examination may be conducted with sufficient ease, quickness, and certainty to become a useful "laboratory test." For this purpose we have made use of some of the cultural reactions of the two organisms, especially those with dextrose and other sugar broths, and litmus lactose agar. Differences are also manifest in appearance, in gelatin and agar tube cultures, in the effect produced in nitrate and indol solutions, and on potato. A more comprehensive comparison of the two organisms may be made from the descriptions below:

CHARACTERISTICS OF COLON BACILLI AND SEWAGE STREPTOCOCCI.

COLON BACILLI.	SEWAGE STREPTOCOCCI.
FORM.	
Bacillus 2-3μ long by 0.5μ wide; rounded ends.	*Coccus* 1μ in diameter.
GROUPING.	
Occurs singly, or in short chains or masses.	Occurs in short chains, often in pairs.
MOTILITY.	
Actively motile.	Non-motile.
SPORE FORMATION.	
None.	None.
GELATIN PLATE.	
Thin, irregular film. Much as on agar, colonies smaller.	Colonies similar to those on agar; no liquefaction.
GELATIN STICK.	
Three days: transparent nail growth; gelatin not liquefied.	Three days: nail growth, apparently made up of isolated colonies; very slight spreading on surface.
AGAR PLATE.	
Twelve hours: surface colonies opalescent, nearly circular, edges smooth. Submerged colonies clear cut, lenticular. Two days: surface colonies take irregular vine-leaf form.	Colonies small; under a low power somewhat irregular in shape; edges smooth.

AGAR SLOPE.

Twenty-four hours; luxuriant, moist, opalescent, translucent, white growth, narrowing from bottom to top.	Twenty-four hours: faint dotted growth.

NUTRIENT BROTH.

Twelve hours: distinct turbidity. Eighteen hours: sediment. Two days: no scum on surface.	Eighteen hours; turbidity and perceptible sediment; on shaking, sediment rises in spiral.

LITMUS MILK.

Litmus reddened, and then decolorized in twelve hours: milk coagulated in eighteen hours.	Twelve hours: slightly acid; litmus slightly decolorized. Eighteen hours: strongly acid. Thirty-six hours: milk coagulated.

POTATO.

Luxuriant, dirty yellow growth; potato not discolored.	Hardly perceptible white growth after three days.

DEXTROSE BROTH.

Twelve hours: dextrose fermented with formation of acid and gas.	Eighteen hours: strongly acid; no gas; sediment and turbidity in both arms.

SACCHAROSE BROTH.

Twelve hours: saccharose fermented with formation of acid and some gas.	Eighteen hours: turbidity and sediment, but no evidence of change in sugar.

LACTOSE LITMUS AGAR PLATE.

Litmus reddened in twenty-four hours; bubbles of gas formed.	Twelve hours: litmus reddened; colonies small, with slight pink tint as if colored by litmus.

PEPTONE AND SALT (DUNHAM).

Three days: pronounced nitrosoindol reaction.	Apparently no growth.

ANAEROBIC AGAR SLOPE.

Thin, transparent growth, much less strong than in aërobic streak.	Dotted growth, less strong than in aërobic culture.

Our preliminary experiments were based on the results of Winslow and Miss Hunnewell, and of one of the writers in the other papers mentioned. In view of our results, it seemed probable that there would be little difficulty in establishing a time relation between the growth periods of the two organisms in dextrose broth which would allow the isolation of both from the same culture if both were originally present in the sample used for inoculation. The soundness of this conclusion was first tested experimentally by the use of mixtures in known ratios

of the two organisms in question, the culture used for this purpose being isolated from fresh feces by inoculation into dextrose broth, and plating out upon litmus lactose agar after six and forty-eight hours incubation at 37°C.

The method was as follows: Two bottles of sterile water, containing 100 c.c. each, were inoculated, one with B. coli, the other with streptococci, and plates made from these to determine the number of each kind of bacteria used. With the water suspensions thus prepared mixtures were made, of various dilutions and proportions, of B. coli and streptococci. From each of these mixtures several Smith fermentation tubes containing dextrose broth (meat juice with 1 per cent. peptone and 2.5 per cent. dextrose) were inoculated with 1 c.c. each. The dextrose tubes were then incubated at 37° C., and litmus lactose agar plates made from them at various intervals. In plating, 1 c.c. of the dextrose broth culture was diluted in sterile water to approximately 1 : 100,000; 1 : 1,000,000 or 1 : 10,000,000; and 1 c. c. of this dilution inoculated into plates containing lactose agar to which sterile neutral litmus had been added. These plates were incubated at 37° C. for twenty-four hours, and then allowed to stand for some time at the room temperature before counting.

The colonies of B. coli and streptococci were distinguished by their different tints in the litmus lactose agar plate, and by further differences in shape and general appearance. The submerged colon colonies generally appeared of an oval or lenticular shape, and were not strongly acid. The streptococci, on the other hand were most frequently spherical or nearly so, and became much more intensely reddened. After a little practice the two kinds of organisms could be detected without difficulty. In order to avoid error in this respect, however, cover-glass preparations from the separate colonies were examined microscopically for the morphology of the bacteria throughout the early part of the investigation.

The results obtained varied widely, as was to be expected, according to the number and proportions of the organisms inoculated. There was, however, in every case a period during which the colon bacilli were abundant in the dextrose tubes, while the streptococci were indistinguishable or nearly so. This condition was followed by a decrease in the number of B. coli and a sudden increase in streptococci, the colon bacilli at length becoming imperceptible and the streptococci rising to a maximum at which they persisted for a considerable time. The following tables show the numbers inoculated and the numbers found in the tubes at different platings:

TABLE I.

SERIES I.

	Tube Numbers.				
	1	2	3	4	5
Ratio — streptococci to B. coli inoculated	1:10	1:5	3:10	1:20	1:30
No. of B. coli inoculated	145,000	145,000	145,000	290,000	435,000
No. of streptococci inoculated	14,500	29,000	43,500	14,500	14,500
Millions per c.c. of colon bacilli present after 9 hours	5.5	6.8	10	12	12.5
Streptoc'i present after 9 hours	0	0	0	0	0

NOTE. — This was a preliminary series to determine dilutions to be used and the general behavior of the bacteria. It was only possible to count the first plating.

The colonies of B. coli and streptococci were distinguished by the different tint in the litmus lactose agar plate, and by differences in shape and appearance. To be perfectly certain, however, cover glass preparations from the separate colonies were examined microscopically.

SERIES II.

	Tube Numbers.				
	6	7	8	9	10
Ratio — streptococci to B. coli inoculated	1:16	1:8	1:5	1:32	1:50
No. of B. coli inoculated	100,000	100,000	100,000	200,000	300,000
No. of streptococci inoculated	6,000	12,000	18,000	6,000	6,000
No. found in tubes (millions per c.c.) after —					
18 hours, B. coli	600	500	440	420	410
Streptococci	0	0	0	0	0
27 hours[1]	400	600	500	450	300
42 hours B. coli	0	0	0	..	0
Streptococci	62	120	135	.....	154
51 hours, B. coli	0	0	0	0	0
Streptococci	60	100	115	90	85
65 hours, B. coli	0	0	0	0	0
Streptococci	70	65	35	80	80
95 hours, B. coli	0	0	0	0	0
Streptococci	90	70	48	85	90

[1] Proportions indeterminate.

SERIES III.

	Tube Numbers.		
	11	12	13
Ratio — sterptococci to B. coli inoculated	21:1	210:1	105:1
No. of B. coli inoculated	2,250	225	450
No. of streptococci inoculated	47,000	47,000	47,000
No. found in tubes (millions per c.c.) after —			
9 hours, B. coli	Many[a]	Many[a]	Many[a]
Streptococci	0	0	0
12 hours, B. coli	400	260	100
Streptococci	100	240	210
14 hours, B. coli	360	.....	290
Streptococci	110	.....	260
24 hours, B. coli	30	50	0
Streptococci	270	450	370
33 hours, B. coli	110	0	0
Streptococci	230	500	274
50 hours, B. coli	0	0	0
Streptococci	280	280	285
77 hours, B. coli	0	0	0
Streptococci	270	400	400

[a] Count not made.

SERIES IV.

	Tube Numbers.		
	14	15	16
Ratio — streptococci to B. coli inoculated	1:100	1:1	100:1
No. of B. coli inoculated	160,000	1,600	1,600
No. of streptococci inoculated	1,700	1,700	170,000
No. found in tubes (millions per c.c.) after —			
11 hours, B. coli	350	320	300
Streptococci	0	0	0
14 hours, B. coli	640	350	200
Streptococci	30	70	170
19 hours, B. coli	400	340	32
Streptococci	110	104	124
24 hours, B. coli	494	354	74
Streptococci	80	96	284
33 hours, B. coli	346	112	0
Streptococci	100	58	280
41 hours, B. coli	3	0	0
Streptococci	60	83	147
67 hours, B. coli	0	0	0
Streptococci	6.2	0.18	0.51
85 hours, B. coli	0	0	.....
Streptococci	0.22	0.22	.....
Gas formation begun after	6 hours	9 hours	10 hours

SERIES V.

	Tube Number	
	17	18
Ratio — streptococci to B. coli inoculated	1:2	53:1
No. of B. coli inoculated	32	3
No. of streptococci inoculated	16	160
No. in tube (in millions per c.c.) after —		
11 hours, B. coli	2.5	7.6
Streptococci	0.3	0.3
25 hours, B. coli	160	554
Streptococci	380	100
37 hours, B. coli	0.1	194
Streptococci	200	60
43 hours, B. coli	0	0
Streptococci	300	83
62 hours, B. coli	0	0
Streptococci	268	61
Gas formation begun after	15 hours	16 hours

To facilitate the systematic study of these results, we insert the following table, showing the time of approach of B. coli to a maximum, the time of appearance of streptococci, that of the approximate disappearance of B. coli, and that of the first formation of gas, in the few cases in which it was recorded.

TABLE II.

Tube Number.	B. coli inoculated.	Streptococci inoculated.	First Gas Formed.	B. coli maximum.	Appearance of Streptococci.	Disappearance of B. coli.
16	1,600	170,000	After 10 hrs	After 11 hrs	After 14 hrs	After 33 hrs
11	2,250	47,000	..	12	12	50
13	450	47,000	..	10	12	24
12	225	47,000	..	12	12	33
8	100,000	18,000	..	18	..	42
7	100,000	12,000	..	18	..	42
9	200,000	6,000	..	18	..	42
10	300,000	6,000	..	18	..	42
14	160,000	1,700	6	14	14	67
15	1,600	1,700	9	11	14	41
17	3	160	16	25	11	43
18	32	16	15	25	11	43

This table seems to indicate that, while the time of appearance of gas varies inversely with the numbers of B. coli originally present, the colon maximum and the appearance of streptococci vary inversely with the number of streptococci first used, and the disappearance of the B.

coli with the ratio of streptococci to colon bacilli. Some of the variations we are at a loss to explain, but it may be that further experiments will show that they were accidental.

EXAMINATION OF SEWAGE AND POLLUTED WATERS.

The results obtained with the mixture of known ratios gave promise of usefulness when the method was applied to actual examination of water and sewage, and in general the results have been much the same.

About fifty samples of waters have been examined. Each of these was tested quantitatively by making a suitable dilution, plating in litmus lactose agar, and incubating for twenty-four hours at 37°. The majority of the colonies thus obtained gave a well-marked acid reaction, but this was not specially recorded in the counting. At the time of plating 1 c.c. of each sample was inoculated into dextrose broth.

A preliminary series was first examined as a test of the method. The samples were as follows:

a) Crude sewage from Dartmouth street (Boston), sewer, diluted 1:100, April 22.
b) Charles River, at Otter street, April 22.
c) Charles River, at Exeter street, April 22.
d) Charles River, at Newton Lower Falls, April 30.
e) Charles River, at Pinckney street, April 30.

The results obtained by plating after various periods are shown in the accompanying tables.

The method proving fairly satisfactory, a systematic examination of forty-six samples of water was next undertaken. The number of bacteria present was determined in some cases by plating on gelatin, and the number of acid-producing colonies in litmus lactose agar was also usually noted.

From the tables it is apparent that the waters showed in general the same periodic changes as did the artificial mixtures: pure cultures of B. coli were first obtained in the plates, then the gradual displacement of one form by the other took place, and at length only streptococci or allied forms were discernible. In a few instances the results were somewhat obscured by the growth of a proteus-like organism which developed in the open arm of the dextrose broth tube, but in our opinion both B. coli and streptococci can be detected in water by this method in almost all cases when both organisms are present, provided the number of conflicting organisms does not greatly exceed that of the colon bacilli.

TABLE III.

SERIES A.

	Tube Number.		
	a	*b*	*c*
No. of bacteria inoculated	580,000	17,000	17,000
No. in tubes (millions per c.c.) after—			
11 hours, B. coli	274	100	280
Streptococci	0	0	0
14 hours	....	138	422
19 hours, B. coli	50	0	0
Streptococci	190	60	210
24 hours, B. coli	2	0	2
Streptococci	180	250	230
33 hours, B. coli	22	8	3
Streptococci	154	47	10
41 hours, B. coli	6	0	5
Streptococci	134	8	58
67 hours, B. coli	0	0	0
Streptococci	40	51	23
85 hours, B. coli	0	0	0
Streptococci	11	37	19
Gas formation begun after	6 hours	8 hours	8 hours

SERIER B.

	Tube Number.	
	d	*e*
No. of bacteria inoculated	1,200	9,000
No. found in tubes (millions per c.c.) after—		
11 hours, B. coli	3	16
Streptococci	0	0
25 hours, B. coli	8	20
Streptococci	0	300
35 hours, B. coli	..	0
Streptococci	...	200
43 hours, B. coli	0	0
Streptococci	175	178
Gas formation begun after	13 hours	10 hours

That certain definite cultural relations exist between colon bacilli and streptococci when grown together in dextrose broth, and when no conflicting organism is present in great abundance, is evident from the results with waters, as well as with mixtures of known ratio. The colon bacilli invariably develop with greater rapidity than the streptococci under the cultural conditions which we have employed, but the

latter finally overgrow or kill out the colon bacilli. This fact is probably due to the greater sensitiveness of B. coli to the lactic acid produced in the medium by the streptococci over and above that formed by the colon bacilli themselves.

TABLE IV.

SERIES I.

	Sample Number.									
	1	2	3	4	5	6	7	8	9	10
Total bacteria, gelatin count	250	25	123	271	300	64	45	65	8	33
Acid-produc'g bacteria litmus lactose agar	4	10	9	5	8	55	35	460	1250	105
No. of bacteria (mill. per c.c. after gr'th in dext. broth for—										
11 hours, B. coli	1	20	68.4	200	185	400	130	332	420	410
Streptococci	0	0	0	0	0	0	0	0	0	0
16 hours, B. coli	200	76	130	270	220	210	140	420	285	410
Streptococci	40	25	20	10	45	30	20	210	75	145
23 hours, B. coli	280	150	385	370	300	570	200	405	320	300
Streptococci	140	85	280	170	300	1700	110	350	370	350
39 hours, B. coli	0	0	25	110	0	210	20	24	105	....
Streptococci	474	420	480	300	390	170	400	105	250	....
63 hours, B. coli	0	0	0	0	0	12	8	0	0	0
Streptococci	2	0	0	45	1	2	45	150	86	170
First gas noted after (hours)	10	10	9	9	10	8	10	6	6	8

SERIES II.

	Sample Number.						
	11	12	13	14	15	16	17
Gelatin count	20000	20000	.....	.....	.....	.....	.....
Red colonies	0	6	0	0	0	1	8
No. of bacteria (mill. per c.c.) after gr'th in dext. broth for—							
8 hours, B. coli	1.2	11.4	6.8	6.7	6.9	8.5	0.5
Streptococci	0	0	0	0	0	0	0
22 hours, B. coli	300	500	350	450	440	358	2000
Streptococci	200	60	225	136	10	265	300
32 hours, B. coli	130	10	70	170	50	300	490
Streptococci	220	200	620	210	160	540	280
46 hours, B. coli	0	.....	Few[a]	0	100	100	Few[a]
Streptococci	7200	.....	Many	7000	3000	1000	Many
60 hours, B. coli	280	1	0	.....	.....	.....	62
Streptococci	80	180	640	.....	.....	.....	20

[a] Count inaccurate, owing to presence of conflicting organisms.

SERIES III.

	Sample Number.							
	18	19	20	21	22	23	24	25
Gelatin count	Not made.							
Red colonies	1	150	25	30	50	170	200	30
No. of bacteria (mill per c.c.) after growth in dext. br. for—								
7 hours, B. coli	0.02	.....	.....	0.01	0.04	0.12	0.55	1.1
Streptococci	0	.....	.....	0	0	0	0	0.01
17 hours, B. coli	266	100	88	350	510	380	330	160
Streptococci	150	0	40	140	240	128	80	220
Streptococci	800	860	670	1080	2500	4380	0	3900
40 hours, B. coli	0	0	10	22	36	7	7.2	.....
27 hours, B. coli	520	610	72	700	1000	740	100	300
Streptococci	252	330	260	22	66	60	5.2	.....
52 hours, B. coli	10	16	38	20	70	35	10	27
Streptococci	40	16	3.8	31	41	25	10	30

SERIES IV.

	Sample Number.	
	26	27
Gelatin count	1000	940
Red colonies	1200	20
Number of bacteria (millions per c.c.) after growth in dextrose broth for—		
6 hours, B. coli	Growths secured by other organisms.	
Streptococci		
19 hours, B. coli	250	230
Streptococci	52	300
31 hours, B. coli	180	120
Streptococci	440	300
43 hours, B. coli	90	480
Streptococci	...	400
54 hours, B. coli	12	15
Streptococci	470	620

Under the favorable conditions at first existing, the colon bacilli develop very rapidly, fermenting the dextrose with the formation of gas and acid in from six to eighteen hours (the time varying according to the number of these organisms originally present), and attain a maximum in from twenty to thirty-six hours. The streptococci gradually increase along with the formation of larger quantities of lactic acid, until at the end of fifteen to twenty-four hours they become distin-

guishable in plates inoculated from the dextrose tube. At about the same time the colon bacilli apparently become unfavorably affected by the increase in acidity, and rapidly decrease until they are no longer perceptible. The increase in streptococci is rapid after they appear — so rapid, in fact, that small numbers of B. coli would hardly affect the efficiency of an isolation made a few hours before the colon bacilli disappear. The streptococci attain a maximum soon after the other organisms disappear, and remain near this maximum for one or two days. The time of incubation allowable before making plate cultures for isolation of streptococci has, therefore, wide limits.

The time of beginning of gas formation is a factor of considerable importance. In the few cases in which this time was noted with our mixtures of known ratio, the colon bacilli attained their maximum numbers within a few hours after gas formation began. In the case of the polluted waters, however, a somewhat longer period may intervene between the first appearance of gas and the numerical colon maximum, but in our experiments the latter generally occurred within twenty-four hours of the time of inoculation. This fact has a direct bearing on laboratory procedure. Since, in ordinary practice with the fermentation tube as applied to water examination, gas formation is expected if B. coli is present, and since streptococci are likely to appear soon after gas formation begins, it would seem advisable to look for B. coli in the confirmatory tests immediately after the first appearance of gas, rather than after a twenty-four to forty-eight hour period, as has been customary in some laboratories.

SERIES V.

	Sample Number.								
	28	29	30	31	32	33	34	35	36
Gelatin count	.....	.....	5	41	34	45	160	214	....
Red colonies	Not determined.								
No. of bacteria (mill. per c.c.) after gr'th in dext. broth for—									
12 hours, B. coli	200	"	"	"	120	120	3	50	300
Streptococci	.....	.....	.....	.....	0	0	0	4	20
24 hours, B. coli	100	380	370	410	400	330	.....	80	360
Streptococci	900	60	380	620	500	140	.....	150	180
36 hours, B. coli	290	50	80	20	50	20	440	20	60
Streptococci	50	150	440	280	340	1500	90	320	200
60 hours, B. coli	280	1	0	.....	.....	.....	64	.....	3
Streptococci	80	180	640	.....	.....	.....	25	.....	65

SERIES VI.

	Sample Number									
	37	38	39	40	41	42	43	44	45	46
Gelatin count	38	12	22	15	35	115	70	72	105	40000
Red colonies	16	2	2	2	31	6	13	16	15	1200
No. of bacteria (mill. per c.c.) after gr'th in dext. broth for—										
12 hours, B. coli..	55	16	22	0	70	100	300	700	130	[a]
Streptococci ...	0	0	0	0	0	0	0	0	10	.....
24 hours, B. coli..	360	} Proetus		400	.....	260	320	550	720	40
Streptococci ...	360			Few	.....	140	170	300	500	200
36 hours, B. coli..	0	0	70	25	[b]	40	240	260	0	0
Streptococci ...	Many	500	300	75	[b]	100	100	180	Many	450
48 hours, B. coli..	0	2	0	0	0	0	[b]	0	0	0
Streptococci ...	2	6	3	40	1	26	.....	9	10	7

[a] Conflicting organisms.
[b] Other organisms party obscured the medium.

From the results of this investigation we suggest as a method for the detection of B. coli and sewage streptococci in water the following procedure:

Inoculate the desired quantity of water, preferably 1 c.c., into dextrose broth, in a tube or apparatus suitable for the ready determination of gas production. Incubate at 37° C.

After a few (six to twelve) hours' incubation examine the cultures for gas. Within two or three hours after the gas formation is first evident plate the broth, into litmus lactose agar, incubating for twelve to eighteen hours at 37° C. If at the end of this time no acid-producing colonies are present, it is probably safe to assume that there were no colon bacilli present. If, on the other hand, red colonies are present, these must be further examined by the usual diagnostic tests for B. coli.

After the first plating from the dextrose broth replace the fermentation tube in the incubator, allow it to remain there for thirty-six hours, and then plate again in litmus lactose agar. This plating should give a nearly pure culture of streptococci, if these organisms were originally present in the water.

If colon bacilli are not found in the first set of plates, the streptococci may still be isolated, if present, by this method, or possibly after a somewhat shorter period of incubation than we have suggested.

A POSSIBLE RAPID TEST FOR STREPTOCOCCI.

Since the streptococci follow the colon bacilli in their development in the dextrose tube it is plain that they can easily withstand an amount of acid such as is produced in the tube by B. coli. We have taken advantage of this fact in attempting to devise a method for the detection of streptococci without waiting for colon bacilli to develop; since it seems desirable, if streptococci are to be reckoned with in the future as a part of the regular routine of bacteriological water analysis, to have this determination parallel with that of B. coli, and as rapid as possible. We have accordingly proposed to use for this purpose a medium of sufficiently high acidity to inhibit the growth of B. coli and of most water bacteria, but which shall still permit the development of streptococci.

The question, however, arises whether the desired result is to be determined by the kind of acid used or by the mere degree of acidity; *i. e.*, whether the effect is limited to the particular acid produced by colon bacilli, namely, lactic acid; or may be secured by the presence of a sufficient quantity of such acids as hydrochloric or sulphuric, as well as lactic. We have therefore determined by titration the approximate amount of acid produced in dextrose broth up to the period of maximum numbers of B. coli, and have prepared a dextrose broth of slightly greater acidity than that indicated by these titrations. On inoculation of such broth with fresh, raw sewage in great dilution, we have succeeded in cultivating streptococci in a nearly pure condition after only 24 hours' incubation. Further consideration of this problem is reserved for another paper.

In conclusion the authors wish to acknowledge with gratitude their indebtedness to Professor W. T. Sedgwick for helpful suggestions and his kindly interest in the work.

BIBLIOGRAPHY.

1. DYAR, H. G., AND KEITH, S. C., JR. "Notes on Normal Intestinal Bacilli of the Horse, and of Certain Other Domestic Animals." *Tech. Quart.*, 1893, 6, 256.
2. SMITH, T. "Ueber den Nachweis des Bacterium coli communis im Wasser." *Centr. f. Bakt.*, 1895, 17, 726.
2A. FLINT, J. M. Notes on the Distribution of B. coli communis. *J. of the Am. Med. Assoc.*, 1896, 26, 410.
3. BELITZER. "Zur Lehre über das Bacterium coli communis." *Rev. Jahr. u. d. path. Mikr.*, 1899, 15, 326.
4. MOORE, V. A. AND WRIGHT, F. R. "A comparison of B. coli communis from Different Species of Animals." *J. Bost. Soc. Med. Sci.*, 1900, 4, 175.
5. KRUSE, W. "Kritische und experimentelle Beiträge zur hygienischen Beurtheilung des Wassers." *Zeit. f. Hyg.*, 1894, 17, 1.

6. WEISSENFELD, J. "Der Befund des Bacterium coli und das Thier-experiment sind keine brauchbaren Hülfmittel für die hygienische Beurtheilung des Wassers." *Ibid.*, 1900, 35, 76.
7. PRESCOTT, S. C. "On the Apparent Identity of the Cultural Reactions of B. coli communis and Certain Lactic Bacteria." *Science,* 1902, 15, 363.
8. PRESCOTT, S. C. "On Certain Precautions Required in Making and Interpreting the So-Called 'Colon Test' for Potable Waters." *Medicine,* 1903, 9, 20.
9. PAPASOTIRIU, J. "Untersuchungen über das Vorkommen der Bact. coli in Teigmehl und Getreide, nebst einigen Bemerkungen über die Bedeutung der Bact. coli als Indikator für Verunreinigungen von Wasser und Fäkalien." *Archiv f. Hyg.,* 1902, 41, 204.
10. FREUDENREICH, E. VON. "Ueber den Nachweis des Bâccillus coli communis im Wasser und dessen Bedeutung." *Centr. f. Bakt.* 1895, 18, 102.
11. SMITH, T. "Water-Borne Diseases." *J. N. E. Waterworks Assn.,* 1896, 10, 203.
12. LAWS AND ANDREWES. "Report on the Micro-Organisms of Sewage," *Report to the London County Council,* 1894, No. 216.
13. HOUSTON, A. C. "Bacterioscopic Examinations of Drinking Water, with Particular Reference to the Relation of Streptococci and Staphylococci with Waters of This Class." *Ann. Rep. L. G. B.,* containing *Rep. of Med. Off.,* 1899; *Ann. Rep. L. G. B.,* containing *Rep. of Med. Off.,* 1900.
14. HORROCKS, W. H. *Bacteriological Examination of Water.* London, 1901.
15. WINSLOW, C.-E. A. AND HUNNEWELL, MISS M. P. "A Study of the Distribution of the Colon Bacillus of Escherich and of the Sewage Streptococci of Houston in Polluted and Unpolluted Waters." *J. Med. Res.,* 1902, 3, 3, N. S., 502.
16. PRESCOTT, S. C., "A Note on Methods of Isolating Colon Bacilli." *Science,* 1902, N. S., 16, 408, 671.
17. GAGE, S. DEM. "Bacteriological Studies at the Lawrence Experiment Station, with Special Reference to the determination of B. coli." *33d Ann. Rep. Mass. S. B. H.,* 1901.
18. LEGROS, F.-L. *Monographie des streptocoques et des agents des spetice mies metadiphteriques, particulierement des diplocoques.* Paris, 1902.

ABSTRACT OF A PAPER ENTITLED "ISOLATION OF BACILLUS COLI COMMUNIS FROM THE AILMENTARY TRACT OF FISH AND THE SIGNIFICANCE THEREOF."

By GEORGE A. JOHNSON, New York City.

It has been shown that the colon bacillus is taken up by fish, and the results of the experiment described indicate that it multiplies rapidly in the intestinal tract of the same. It has been shown that a search of a large number of fish caught in an unpolluted water failed to reveal the presence of this organism in the intestinal tract. It would seem possible, therefore, that fish, having taken up the colon bacillus from a polluted water might migrate to a water of comparative purity where they would naturally discharge the greatly increased number of these organisms.

Whether the finding of the colon bacillus deposited in a water in this manner would depreciate the value of the colon test in the examination of a public water supply is a question. It would certainly appear that if the colon bacillus can be thus easily transferred from one water to another that the transportation of the typhoid bacillus may be considered quite as likely. At least the above results may explain the apparent phenomenon frequently noted where *B. coli communis* is found in comparatively large numbers in waters apparently open to but remote chances for fecal contamination.

ON THE VALUE OF TESTS FOR BACTERIA OF SPECIFIC TYPES AS AN INDEX OF POLLUTION.*

By H. W. CLARK and STEPHEN DeM. GAGE, Lawrence, Mass.

In recent years increased attention has been given, by those interested in sanitary problems, and espcially water supply and water purification, to methods for the determination of fecal bacteria in water, and to the significance of their presence as a determining factor in judging the degree of purity of a water.

During the past eight years the work at the Lawrence experiment station along this line has covered a wide field, and over 18,000 samples, including 4,700 samples of polluted river water, 9,100 samples of filtered waters, 2,200 samples of other potable waters, from springs, curb wells, tubular wells, domestic wells, ponds and other surface supplies, etc., and 2,100 miscellaneous samples, including shell-fish, sea-water, ice, milk, dust, excrement from men and animals, grains, food stuffs, etc., have been examined. Investigations have been made upon the seasonal distribution of B. coli, upon the elimination of B. coli from water by storage and by freezing, upon the relative occurrence of the various types of fecal bacteria in different classes of samples, upon the value of the various methods for the determination of fecal bacteria, and upon the relative viability of B. coli and B. typhosus under a variety of conditions.

SIGNIFICANCE OF THE VARIOUS TEST TYPES.

Of the various forms of bacteria used as indices of sewage pollution, the principal ones are B. coli, the sewage streptococcus and B. sporogenes. Of these, B. coli has formed a basis for the greatest amount of work; nevertheless, the other two have considerable standing among various observers in different parts of the world. B. coli is supposed to show present or past pollution, usually recent pollution. The streptococcus type, it is stated, should show only very recent pollution by sewage; evidence as to this, however, has not been forthcoming. The bacillus sporogenes, being a spore-forming organism, may show present pollution and it may also show pollution which has occurred at some previous time, and from which the danger has now entirely ceased. The two so-called paracolon types, that is, the aerogenes, or enteridi-

* This is an abstract of an article by the authors in the 34th annual report of the Massachusetts State Board of Health, pages 244-281.

tis, Gärtner, type and the chologenes type, are introduced here merely because in some laboratories one or the other is included under the colon type. As to the distribution of the colon, aerogenes and chologenes types, there is a large amount of data. The data concerning the streptococcus type is not as complete. Houston[1] describes twenty-one cultures, among which there appear to be at least seven distinct species, while the same number of species have been isolated and described at the Lawrence experiment station.[2] Winslow and Hunnewell[3] report the finding of sewage streptococcus in a variety of apparently unpolluted samples. It certainly is a fact that micrococcus forms in general are abundant in the air and in the soil. The data concerning B. sporogenes, belonging as this organism does to that restricted and little studied group of bacteria, the pathogenic, spore-forming, obligate anaerobes, is very meagre indeed. At present we know of only two other species which would be included by the usual sporogenes test.

In the examination of water or other substances for present pollution, tests for the specific organism which is most numerous in sewage and for which the tests are most exact, are of the most value, always assuming that this organism is characteristic of sewage and is not found, or at least is only occasionally found, in sources removed from pollution. Examinations of a large number of samples of sewage at the experiment station show that in dilutions 1 : 10,000 we may expect to find B. coli in 95 per cent. of the samples, and that we may identify the sewage streptococcus in 67 per cent. of the samples. A dilution of 1 : 50,000 cuts the percentage of positive tests for B. coli to 78 per cent. of the samples, and the percentage of streptococcus to 6 per cent. of the samples. In dilutions of 1 : 100,000 B. coli was found in 40 per cent. of the samples, and in a dilution of 1 : 1000,000 B. coli was found in 6 per cent. of the samples. The sewage streptococcus could not be identified in dilutions greater than 1 : 50,000. B. sporogenes can usually be detected in dilutions of 1 : 500 to 1 : 1,000, but in dilutions greater than this it is rarely detected. In other words, we may expect to obtain a diagnosis with B. coli in such dilutions that the presence of B. sporogenes or of the sewage streptococcus could not be detected.

During a period of six months in 1902 and 1903, daily examinations were made for these three organisms in the Merrimack river water and in the effluent from the Lawrence city filter. In the polluted river water, when testing one cubic centimeter, B. coli were found in 90 per cent. of the samples examined, bacteria of the sewage streptococcus type were found in 45 per cent. of the samples, and B. sporogenes were found in only 24 per cent. of the samples. In the filtered water,

B. coli were found in 5 per cent. of the one cubic centimeter samples, and in 10 per cent. of the 100 cubic centimeter samples. The sewage streptococcus was not found in volumes as large as 100 cubic centimeters. B. sporogenes was not found in one cubic centimeter but was found in 14 per cent. of the samples when testing 100 cubic centimeters.

During a period of four months in 1903, samples of milk from Lawrence dealers were tested daily for fecal bacteria. B. coli were found in 4 per cent. of these samples, bacteria of the sewage streptococcus type were found in 3 per cent. of the samples, and B. sporogenes were found in 10 per cent. of the samples.

A number of investigators have published results seeming to show the presence of bacteria of the colon type in samples from sources apparently removed from pollution, and these results tend to discredit the value of tests for organisms of this type as an indication of sewage pollution. That B. coli are widely distributed is not to be disputed when we consider that this organism is found in the fecal discharges of men and the major animals widely used as a dressing for arable soil, and in the intestinal contents of many of the smaller animals, both domestic and wild, and in the evacuations from fowls and some of the migratory birds. Flies and other insects may also act as carriers of these germs, depositing them in places where we would least expect to find them. Examinations of 48 flies at the experiment station resulted in finding B. coli in or on nine of these, and bacteria of the sewage streptococcus type in or on three others. No relation could be traced between the locality where these flies were caught and the finding of the test organisms.

Nevertheless, corroborated evidence that the finding of organisms of the colon type in sources apparently remote from pollution is proof that these bacteria are natural rather than chance inhabitants of these sources, has not been forthcoming, such findings, on the other hand being additional evidence of minute pollution and of the extreme delicacy of the test by which we are able to detect it.

The fact that Klein and Houston[4] found organisms similar to B. coli in commercial food stuffs, and have been supported in their findings by a number of other investigators, has been the basis of an attempt to show that the colon bacillus is merely a member of a larger group of saphrophytes of the so-called lactic acid group. These critics, however, fail to note the fact that Klein and Houston also found in these same samples of cereals, bacteria of the sewage streptococcus type and of the B. sporogenes type, both of which types are offered as indicating sewage pollution. If we accept the fact that these observers found B. coli, we must also acknowledge that, as shown by other bacterial tests made by them, the grains which they tested had at some

time been exposed to pollution. At the experiment station a number of samples of grains have been examined for B. coli, all of these samples, however, being carefully collected directly from the fields where they were growing, and in no case has any organism been found which would be confounded with the colon type, notwithstanding the fact that 25 samples of corn were examined which were grown upon a municipal sewage filtration area to which sewage was being applied daily.

THE SO-CALLED PRESUMPTIVE TEST AND ITS SIGNIFICANCE.

In some laboratories work upon the determination of fecal bacteria of the colon type is limited to what is known as the presumptive test, that is, the formation of gas in dextrose broth inoculated with a sample of the water under examination. In other laboratories the procedure corresponds with that used at Lawrence,* except that the test for indol or that for the reduction of nitrates is omitted.

A study of the various compilations of bacterial description shows that there are at least 58 well-described species of bacteria of five primary types which would give positive results; that is, be designated as colon bacilli, if we depended upon a presumptive test alone.

Of these 58 species, 12 would be included in the colon type, as it is interpreted at Lawrence, three species are of the chologenes type (bacteria identical with those in the colon type, with the exception that nitrous acid is not formed in nitrate pepton solution), seven species belong to the aerogenes, or enteriditis, Gartner, group (bacteria identical with the colon type with the exception that indol is not produced in pepton solutions and thirteen species would give positive reactions by the presumptive test, in which the descriptions are not sufficiently worked out to identify them with or exclude them from the three preceding groups.

Besides these there are 23 species which would show positive results when tested by the presumptive test alone, which would be readily thrown out by subsequent tests and would never be included in either of the first three groups.

In studies previously reported[5] it was shown that the presumptive test had an efficiency of from 40 to 60 per cent. as an indication of the presence of B. coli, this factor varying with the character of the sample and the degree of pollution. The presumptive test in itself, without confirmatory tests, would, even to the experienced observer, be very difficult of correct interpretation. In the examination of surface water supplies, the presumptive test in small volumes would appear to be of

* For Lawrence B. coli methods, consult 1898 Report of Massachusetts Board of Health, page 533, and 1901 report, page 397.

little value. As the volume was increased, however, to 100 cubic centimeters the presumptive test gave results which agreed more closly with the probable pollution, and with liter samples this connection between the probable pollution and the presumptive test was even closer.

In the examination of well waters of different types the presumptive test frequently gave positive results where the absence of B. coli, and the general character of the samples from all standpoints, showed the samples to be entirely above suspicion. In the examination of shell-fish the presumptive test unconfirmed would lead to very erroneous results. With the shell-fish from sources known to be grievously polluted a positive result was obtained with the presumptive test in only about 80 per cent. of the samples. With samples which were known to be remote from pollution the results were even more misleading, 25 per cent. of the examinations of the intestines of shell-fish from such sources, and 3 per cent. of the samples of sea-water from those sources, giving a positive presumptive test, although B. coli or other fecal bacteria was not found. In the examination of milk over 14 per cent. of the samples showed a positive presumptive test, but something less than 4 per cent. of the samples showed fecal bacteria when the tests were concluded.

In the examination of ice, 5 per cent. of the samples gave a positive presumptive test in one cubic centimeter, as compared with 3 per cent. positive in 100 cubic centimeters. The findings of B. coli, however, were 1 per cent. in one cubic centimeter and 2 per cent. in 100 cubic centimeters, probably nearer the true relation.

B. COLI IN FILTERED WATER.

For several years the B. coli work at Lawrence was almost entirely confined to determinations of this organism in the Merrimack river water and in the effluents of the filters receiving this water. In these studies many thousand tests were made and the work of the Lawrence city filter and of the various experimental filters, operated under a variety of conditions have been observed. This work has already been summarized in the reports of the Massachusetts Board of Health since 1896, in the chapters upon "Filtration of Water."

In the filtration of polluted water, such as that of the Merrimack river, bacterial tests are, as well known, of more value than chemical analyses. The filtered water may be changed but little from the raw water by filtration as far as chemical analyses can determine, and yet a source of danger be absolutely removed as shown by bacterial tests. Long continued comparisons of the bacterial examinations, as applied to raw and filtered waters, have shown that the colon test is a more

delicate indication of filter efficiency, when filtering water as polluted as that of the Merrimack river, than tests of the numbers of bacteria in the filtered and unfiltered waters. Disturbing factors in filtration, shown slightly or not at all by ordinary bacterial counts and comparisons, and yet serious enough to affect the health of a city using filtered water are shown strongly by B. coli tests.

B. COLI IN SPRING WATER.

During an investigation of spring waters upon the market in Massachusetts, made by the State Board of Health in 1900, an account of which was published in the report for that year, 282 samples from ninety-six sources were examined. Fourteen of these samples, or less than 5 per cent., were found to contain B. coli, these fourteen samples being from thirteen different sources. Of the 14 samples in which the germ was found, 6 were collected from springs by employes of the Board, the remaining 8 being samples taken from original packages of the water as supplied by the spring water people to their customers, and the B. coli present in these last samples could probably be traced to carelessness and uncleanliness in bottling or handling the waters.

Of the 6 samples collected directly from the springs, in which B. coli was found, one was from a source which inspection and chemical analysis showed to be unpolluted; one was from a source surrounded by cultivated fields, but without buildings in the immediate vicinity (the chlorine in this sample was above the normal for the region); the other four samples were from locations with either buildings, barnyards, vaults, etc., in the immediate vicinity, and in which the chlorine was above the normal in each case; in other words, in an examination of 282 samples of spring waters, B. coli was found in less then 5 per cent. of the samples, and in most of the samples collected by employes of the Board, in which it was present, evidence of probable pollution was shown by inspection of the surroundings as well as by chemical analysis.

B. COLI IN WELL WATER.

During the past two or three years 170 samples from twenty-five sets of tubular wells and nineteen curb wells, used as sources of public water supply, have been examined for B. coli. Of the 128 samples from tubular wells which have been examined, only one has given a positive test for B. coli, and that when testing 100 cubic centimeters of the water. In the one instance where a positive test was obtained in a sample from a tubular well, this water had been shown to be suspicious by many chemical analyses, and these wells are near one of the most polluted rivers in the State.

Besides the samples from tubular wells, already enumerated, positive tests were given for B. coli in several samples of water from a supply system drawn from tubular wells, this water having become accidentally contaminated by the introduction of polluted surface water at this time sufficient to cause an outbreak of typhoid fever among the consumers of the water. Chemical analysis and determination of numbers of bacteria failing, however, to detect this pollution.

Of the 42 samples from curb wells, one has given a positive test for B. coli when testing one cubic centimeter, and 3 when testing 100 cubic centimeters. The waters in these wells are, however, as shown by chemical analysis and the health of the people using them, probably of a good and safe quality. In the curb wells, many feet in diameter, there is, perhaps, a chance for accidental contamination by B. coli to which the tubular or driven wells are not subject.

Of five hundred and fifteen samples of water from one hundred and eighty-six private or domestic wells, examined during the past two years, 14, or 2.7 per cent., have given a positive test for B. coli when testing one cubic centimeter, and 17, or 3.3 per cent. when testing 100 cubic centimeters of the water.

Studying the complete chemical and bacterial analyses of all these samples of shallow well water, it is evident that gross previous or present pollution of the water, as indicated by high chlorine, unoxidized nitrogen in the form of free ammonia, and oxidized nitrogen or partially oxidized nitrogen in the form of nitrates and nitrites, and positive tests for B. coli in conjunction, was the exception rather than the rule. That is to say, waters that might at some time become dangerous to those using them were more clearly indicated by single chemical analyses than by one or two B. coli tests, or by determinations of the number of bacteria present.

The presence of B. coli at the time of examination may indicate actual danger to health and its absence even in the most polluted of these waters, chemically, may indicate lack of imminent danger, but the chemical analyses are certainly the more decisive.

B. COLI IN SURFACE WATERS.

During the past three years 432 samples from ponds and lakes, within twenty miles of the experiment station, have been examined bacteriologically, tests for B. coli having been made in one and one hundred cubic centimeters during 1901 and 1902, and in one, one hundred and one thousand cubic centimeters during 1903.

Of the 30 samples collected from the lake with the greatest population per square mile of watershed, 5, or 13.3 per cent. of the number collected, gave positive tests when taken one cubic centimeter.

Lake No. 2, with the next greatest population per square mile of watershed, gave positive tests in 3.5 per cent. of the one cubic centimeter samples examined.

Of the two remaining lakes, samples from which gave positive tests for B. coli in one cubic centimeter of water, both have a comparatively small population per square mile of watershed, but both are used more extensively than any other lakes (except perhaps No. 1) for boating and fishing, and both are surrounded by cultivated land and have picnic grounds upon their shores.

Studying the results of tests for B. coli in these waters when testing larger volumes than one cubic centimeter, it was found, that with one exception, even those lake waters not responding positively to this test in one cubic centimeter, gave occasional positive tests in 100 cubic centimeters, and that when one liter was examined, the percentage of positive tests again increased in every instance but one. The results show with considerable clearness that in the examination of surface waters from inhabited localities, the question of obtaining positive tests for B. coli is only one of taking a sufficient volume of water for the test. They also indicate that the degree of contamination of these waters varies inversely as the volume required to give a positive test for B. coli.

EXAMINATION OF SHELLFISH.

During the past three years many samples of shellfish such as clams, oysters, quahogs, scallops, etc., and samples of sea water from the areas whence these shellfish were gathered have been examined at the experiment station for evidence of pollution. In the shellfish samples tests were made for B. coli and for the sewage streptococcus in the body of the shellfish itself and in the juice or water in the shell.

Enough study has been made by many investigators to show that B. coli is not a normal inhabitant of the intestines of clams or oysters, and that its presence in the intestines or juice in the shell, must be due to contamination either by drainage and sewage flowing over the clam and oyster beds, or by careless and uncleanly handling of the shellfish between the time of collecting and placing upon the market. In this work, therefore, the ability to demonstrate clearly the presence of a specific sewage organism such as B. coli, is an invaluable aid in determining the question of purity or pollution.

The following table shows the number of samples of shellfish examined, together with a more or less accurate statement as to the character of the source from which these fish were taken:

TABLE SHOWING RESULTS OF TESTS FOR B. COLI IN SHELLFISH AND SEA WATER FROM POLLUTED AND NON-POLLUTED SOURCES.

Character of source.	Number of sources.		Number of samples.		Per cent. of samples positive.					
					Shellfish.				Sea water	
					Shell water.		Intestine.			
	Shell fish.	Sea water.	Shell fish.	Sea water.	Presumptive test.	Colon Type.	Presumptive test.	Colon Type.	Presumptive test.	Colon Type.
Not polluted	15	10	44	37	0	0	25	0	3	0
Doubtful	22	19	114	80	30	8	71	6	51	17
Polluted	6	4	49	48	75	41	84	35	67	44

In order to acquire more definite information as to the accuracy of the methods for detecting B. coli in shellfish, an extended investigation was made of one clam bed at the mouth of a river polluted by the sewage of a number of large cities, and at one end of the bed, emptying into the river was one of the principal sewers of a city with a population of about 15,000, the clam flats extending from the sewer outfall about one and three-fourths miles to the mouth of the river. In this investigation it was noticed that of the samples taken at varying distances from the sewer outlet, the greatest percentage of positive tests for B. coli was found in samples collected at a distance of one-half to three-fourths of a mile from the sewer. Samples collected at a distance of one-fourth to one half of a mile also gave a greater percentage of positive tests than did samples collected nearer the sewer outlet.

The surface of this clam bed near the sewer and extending perhaps one-eighth of a mile away was covered with a layer of slime (sewage sludge) in an active state of putrefaction, and, as is well known, the organisms of putrefaction are inimical to bacteria of the colon type.

RELATIVE VIABILITY OF B. COLI AND B. TYPHOSUS.

In the use of tests for B. coli in tracing the source of epidemics of typhoid fever, a knowledge of the relative viability of B. coli and B.

typhosus is of considerable importance. Extensive studies along this line at the experiment station have shown us that there is a great similarity between the length of life of these two germs under a variety of conditions. A brief resumé of these experiments is given in the following table:

TABLE SHOWING RELATIVE VIABILITY OF B. TYPHOSUS AND B. COLI UNDER CERTAIN CONDITIONS.

	B. typhosus.	B. coli.
Removal by water filters.	99–100 per cent. removed.	99–100 per cent. removed.
Persistance in filtering material after infection ceased.	24–48 hours.	24–48 hours.
Effect of temperature just before freezing on fluid cultures.	98–99 per cent. killed in 24 hours. May live 5–15 days.	98–99 per cent. killed in 24 hours. May live 12–21 days.
Effect of freezing.	97 per cent. killed in one hour. 99 per cent. killed in 24 hours. May live 280 days.	95 per cent. killed in one hour. 99 per cent. killed in 24 hours. May live 136 days.
Resistance to sun light when spread out in thin layer.	95–99 per cent. killed in 15 minutes. Usually sterilized in 3–6 hours.	80–99 per cent. killed in 15 minutes. Usually sterilized in 2–4 hours.
Resistance to heat, in fluid culture, 5 minutes' exposure.	99 per cent. killed at 55°C. Few individuals may survive up to 80°C. Sterilized at 85°C.	99 per cent. killed at 50°C. Few individuals may survive up to 75°C. Sterilized at 80°C.

CONCLUSIONS.

The principal types of bacteria used as indices of pollution are the colon type, the sporogenes type, the sewage streptococcus type, and occasionally the aerogenes and the chologenes types. The colon type has received the most study, and since it is the most numerous of these types in normal sewage, it is of the most value as a positive indication of sewage pollution.

Results of examinations for B. coli in different volumes of water show the tests in both one and 100 cubic centimeters are of value, the tests in the larger volumes being confirmatory of the tests in the smaller volume. In cases where a considerable number of samples are taken from the same source, the tests in the larger volume frequently give more information as to the quality of the water than do the tests in one cubic centimeter.

As an indication of the presence of B. coli the presumptive test, so-called, has, judging from our own work, little value unless supported by subsequent tests.

In the filtration of a polluted water, such as that of the Merrimack river,[1] bacterial tests are of more value than chemical analyses. The filtered water may be changed but little from the raw water by filtration, as far as chemical analyses can determine, and yet a source of danger may be absolutely removed, as shown or strongly indicated by bacterial tests. Disturbing factors in filtration shown slightly or not at all by ordinary bacterial counts and comparisons are often shown strongly by B. coli tests.

In the examination of ground waters from springs, tubular wells and curb wells, the results of chemical analyses and B. coli tests were generally in accordance in indicating purity or pollution. In the examination of samples of spring waters collected in a proper manner from carefully guarded springs, the degree of the purity of the samples is shown almost absolutely by chemical analyses. Tests for B. coli may, however, show pollution due to carelessness at the spring or in handling the bottled waters which cannot be detected by chemical means.

The complete analyses of samples from a large number of domestic wells show that polluted waters that might become unfit for consumption at any moment are more plainly indicated by a single chemical analysis than by a single determination of B. coli. The presence of B. coli at the time of examination may indicate actual danger of health and its absence even in the most polluted of these waters — chemically — may indicate lack of imminent danger, but the chemical analyses are certainly the more decisive.

The results of the examinations of water from ponds and lakes show with considerable clearness that in the examination of surface waters from inhabited localities, the degree of contamination of these waters varies inversely as the volume required to give a positive test for B. coli, and that the question of obtaining positive tests for B. coli is only one of taking a sufficient volume of water for the test.

In the examination of shellfish from suspected sources, the determination of the fecal bacteria is of considerable importance, as showing the purity or pollution of these sources.

Outbreaks of typhoid fever coincident with the finding of B. coli in normally pure waters, i. e., in water known to be safe under ordinary conditions but becoming polluted by the entrance of polluted water, have occurred within the observation of the writers, where the danger was not indicated by chemical tests or by a significant increase in the numbers of bacteria beyond the usual limits of variation for waters of their class.

Comparative tests of the relative viability of B. typhosus and B. coli show that there is a very great similarity between the length of life of the two germs under a variety of conditions, and that under some circumstances the positive test for B. coli may be interpreted to indicate danger from the typhoid germ.

REFERENCES.

1. Houston, supplement twenty-eighth report Local Government Board, 1899, page 467; supplement twenty-ninth report Local Government Board, 1900, page 458; Clowes & Houston, third report to London County Council on Bacterial Treatment of Sewage, 1900, page 60.
2. Gage, thirty-third annual report Massachusetts State Board of Health, 1901, page 419; Gage and Phelps, Transactions of American Public Health Association, XXVIII, 1902, page 402.
3. Winslow & Hunnewell, Journal of Medical Research, III, December, 1902, page 502.
4. Klein and Houston, supplement twenty-ninth report Local Government Board, 1900, page 604.
5. Gage, thirty-third annual report Massachusetts State Board of Health, 1901, page 397.
6. Thirty-second annual report Massachusetts State Board of Health, 1901, page 538.

ABSTRACT OF A PAPER ENTITLED "STUDIES OF MEDIA FOR THE QUANTITATIVE ESTIMATION OF BACTERIA IN WATER AND SEWAGE."

BY STEPHEN DEM. GAGE AND GEORGE O. ADAMS,
EXPERIMENT STATION, LAWRENCE, MASS.

In a report from this laboratory at the Buffalo meeting, figures were presented, showing that by simplifying the usual culture media, higher counts of bacteria may be obtained, and that the counts on a new medium, Nahrstoff agar, were much higher than on the usual media. These studies have been continued, and while not completed, certain points are presented for consideration.

In standard gelatin or agar, the beef broth is the most fertile source of variation, the amount of nutrient matter in beef-infusion made by the usual method, varying through wide limits.

Of the two best known commercial peptons, Merck's and Witte's, higher bacterial counts are obtained on media made with the latter.

Studies of plain agar made with various kinds of natural water show that in the majority of cases the bacteria naturally present in the given water will develop in greatest numbers in a medium made with that same water.

The salts naturally present in commercial agar have a detrimental effect, greater numbers of bacteria developing on media made with agar from which the natural salts have been washed.

Greater numbers of bacteria will develop on media made without glycerin than on the same media containing glycerin.

With pure cultures of different kinds of bacteria on standard gelatin, agar and Nahrstoff agar the highest counts were obtained, with the species studied, on gelatin and the lowest on Nahrstoff agar.

A reduction of the amount of Nahrstoff in Nahrstoff agar from 1.0% to 0.5% results in a considerable increase in the bacterial counts with various waters.

When cooked in alkaline solution the albumoses of Nahrstoff undergo certain changes in composition which render them better food material for bacteria than is the commercial product.

Studies of the efficiency of water filters in removing bacteria when estimated by counts on different media, show that there is a considerable variation between the various media, the ratio between the numbers of bacteria in the raw water and in the effluent being affected by the period of incubation, the reaction and the composition of the media.

With standard gelatin and Lawrence agar the ratio was less variable between different lots of agar than between different lots of gelatin.

The writers recommend that a standard nomenclature be adopted for the various culture media, the names used, to express as far as possible the composition of the media.

REPORT OF COMMITTEE ON BACILLUS TUBERCULOSIS IN MAN AND ANIMALS.

By MAZYCK P. RAVENEL, M. D., Chairman, Philadelphia, Pa.

Since our last meeting interest in the question of the relation between human and bovine tuberculosis has been unabated, and several papers of interest have been published bearing on the subject.

In America Dr. Theobald Smith has isolated cultures of the tubercle bacillus from human sources having the characteristics and virulence of the bovine organism.

A number of new cases have been reported of accidental infection of man by bovine material, the most important of which is that by Troje, which appears able to bear the most severe criticism.

A young butcher in good health, and with no hereditary taint, wounded his left fore arm slightly while working on a tuberculous cow. The wound healed under treatment, but six weeks later showed signs of inflammation, and a tubercle formed on the internal face of the elbow. There were two small fistulae on the forearm, and enlargement of the ulnar and axillary lymph glands. A month later the middle forearm was covered with granulations which steadily increased in area, and in spite of treatment, at the end of two months assumed the character of lupus. Histologic examination at this time proved the tuberculous character of the disease. Two years after the injury Troje found an abscess which extended into the deep muscular layers. The pus contained tubercle bacilli, and the tissues showed typical tuberculous lesions. Some months after the glands of the left axilla and subclavicular space were extirpated, and proved to be tubercular. All possibility of infection from human sources were excluded by Troje.

Much interest attaches to the report of the Commission of the Imperial Sanitary Office of Germany. In their experiments pure cultures were isolated in all cases and used for inoculation. Cultures were obtained from 39 sources, 23 of which were adults and 16 children. There were 19 cases of pulmonary phthisis, 4 cases of bone tuberculosis, 2 cases of cervical adenitis, 1 case of genito-urinary tuberculosis, 6 cases of miliary tuberculosis, and 7 cases of tuberculosis of the digestive tract. Of the 39 cultures examined, 19 produced no lesion in cattle, 9 caused a slight enlargement of the glands of the shoulder without tendency to generalisation, 7 a somewhat more marked involvement of this gland, while 4 — all obtained from children — caused a generalised infection. Two of these 4 cases are described as "miliary tuberculosis," beginning from a bronchial adenopathy and a mesenteric ade-

nopathy respectively, while the remaining two were cases of intestinal tuberculosis. The cultures from these two last showed a most intense virulence for calves.

The commission points out that two of these four children did not die of tuberculosis, hence they conclude that in only 2 out of 39 cases are they able to say that infection with the bovine tubercle bacillus has caused fatal tuberculosis in man. It is difficult to see the force of such reasoning.

Professor Orth puts a different interpretation on these results, and one which appears to us more correct. He holds that the seven animals which showed marked enlargement of the lymph glands of the shoulder should be considered as infected with the bacillus of human tuberculosis. That the infection did not prove more grave only shows that in cattle as in man tuberculosis may undergo spontaneous cure. Of the 39 cultures studied, Orth considers that 11, or 28%, were virulent enough to infect cattle.

Professor D. J. Hamilton, of the University of Aberdeen, and Mr. Young have carried out a series of experiments on the infection of calves with the human tubercle bacillus. They report that of 19 calves experimented upon, 15 undoubtedly had human tuberculosis transmitted to them by food, respiration, or inoculation. The diagnosis was made by gross and microscopic examination, as well as by inoculation of guinea-pigs.

Dr. Theobald Smith has recently suggested a cultural method for the differentiation of the human and bovine races of tubercle bacillus. Bouillon is prepared as usual for making tuberculin, containing 3% to 5% of glycerin, and the final reaction adjusted to about 2% acid. When cultures of the human type are grown on such bouillon, during the formation of the mycoderm the acidity is gradually reduced, and may reach as low as 0.3%. After the surface is covered the acidity rises again, and may reach 2%, though generally it fluctuates between 0.5% and 1.5%. Bovine cultures, on the other hand, move from the 2% acid reaction to a neutral or alkaline reaction, and remain stationary. This occurs in some cultures at the end of three weeks, in others much later, according to the rapidity and vigor of growth. Dr. Smith has found that tuberculin made from human cultures is strongly acid, while that from bovine cultures is feebly alkaline.

In summing up the available evidence, we feel that there is strong ground for believing in the genetic unity as well as the inter-transmissibility of the human and bovine races of the tubercle bacillus.

We consider that it has been positively proven that a certain proportion of persons, chiefly young children, meet their death through infection with the bovine tubercle bacillus, but the knowledge at hand does not enable us at present to define the extent of this danger.

A TEST OF THE IMMUNITY OF CATTLE INOCULATED WITH TUBERCULOSIS OVER AGAINST A NATURAL EXPOSURE.

By E. A. de SCHWEINITZ,
Bio-chemical Laboratory, Bureau of Animal Industry, and
E. C. SCHROEDER,
Experiment Station, Bureau of Animal Industry, Washington, D. C.

A brief sketch of an experiment which was made in connection with some other tests as to the possible immunity of animals over against a natural exposure may be of interest.

A cow No. 211 which had been tested with tuberculin without reaction in 1902, received injections into the jugular vein of 10 c.c. of a moderately virulent human tubercle culture which had been cultivated in the laboratory for 59 to 62 generations. This culture did not appear to be longer virulent for cattle, although it was still virulent for guinea pigs. The injections were made on July 19, August 6, August 20, September 25, and October 7, 1902, 10 c.c. of culture being used each time, 50 c.c. of culture, therefore, being used altogether. The second injection on August 6 produced an accelerated respiration. Otherwise, though the animal was thin, it appeared to be in a good, healthy and fairly thrifty condition. During this time it had raised a healthy calf. On January 27, 1903, it was placed in a stall with tuberculous animals together with some others for the purpose of trying its immunity. Tested with tuberculin at this time no reaction was noted. On January 30, 1903, it was tested again with tuberculin without reaction. On August 6, 1903, it was killed and postmorten made by Dr. Schroeder. He makes the following records of this examination:

The entire lung was sprinkled with minute white nodules about 1 mm. in diameter. The appearance was similar to that commonly seen in intravenous injections of human tubercle culture into cattle. The other organs and glands did not show tuberculous lesions, and while there were some circular red patches in the mediastinal glands, guinea pigs inoculated from these did not become tuberculous. Guinea pigs inoculated from the lung of this animal died of tuberculosis, showing that there were still live tubercle bacilli in the lung tissue. The presence of these live tubercle bacilli seemed to be due, therefore, to the inoculation with the human culture and not to an infection which the animal might possibly have gotten from the diseased animals in the stalls in which it was exposed. This animal, together with four check untreated animals, and two animals treated with dead bovine and human

tubercle bacilli (in an experiment of Dr. Schroeder) were all exposed to infection in the stable from tuberculous cattle as previously noted on January 27, 1903. The autopsies of these check and other animals showed tuberculosis of a character which could have been contracted from the exposure only, as the animals in the first instance were perpectly healthy. The results of this single experiment did not seem to be very encouraging. While the animal treated with the human germ was apparently resistant to the bovine disease, at the same time the human germ which had originally been injected was still persistent in the animals system and was probably fairly widely distributed. While, therefore, fine animals which are to be used for breeding purposes might perhaps be immunized to advantage by the method, as proposed in 1894, by de Schweinitz, the practicability of such a method as applied to animals that are to be used as food or for the purpose of producing milk is questionable, as it is apparently impossible to say how long the human tubercle bacilli may remain alive.

The experiment is reported as a side issue in connection with a test that is being made for another purpose, and is one case in the line of these general immunization experiments which both ourselves and others in other parts of the country are conducting.

THE PASSAGE OF TUBERCLE BACILLI THROUGH THE NORMAL INTESTINAL WALL. A PRELIMINARY REPORT.

By MAZYCK P. RAVENEL, M. D.,

Bacteriologist to the State Live Stock Sanitary Board of Penna., and Assistant Medical Director of the Henry Phipps Institute for the Study, Treatment and Prevention of Tuberculosis. Philadelphia, Pa.

In the discussion of the question concerning tuberculosis infection through food, some writers have placed great importance on the location of the oldest, or primary lesion, holding that this should be found along the digestive tract if this tube had served as the portal of entry. At first sight this would appear reasonable, but numerous experiments have demonstrated the fallacy of the claim.

In animals infected by feeding, I have repeatedly been struck by the extensive involvement of the lungs, when the intestines were either free of lesions, or only slightly affected.[1] An explanation of these observations had to be sought for.

As early as 1890, Dobroklonski[2] showed that in guinea pigs the tubercle bacillus could penetrate the intestinal wall in the absence of any demonstrable lesion, and after short contact.

In 1895 the late Professor Nocard[3] made the interesting observation that blood drawn from horses under the strictest precautions would often show contamination if taken at certain periods of digestion, while at other times no such contamination would occur. In seeking an explanation of this, two of his students, Desoubry and Porcher[4], showed that in dogs during the digestion of fat large numbers of bacteria were carried through the intestinal wall and could be detected in the chyle by plate cultures. If the dogs were fed material free from fat very few, or even no bacteria were found in the chyle.

Quite recently, 1902, Nicolas and Descos[5] have shown that tubercle bacilli will pass through the healthy intestine of dogs during digestion.

My own experiments on this point were done during the fall and winter of 1902.

Method. — Healthy dogs were selected and kept under observation for some time. A purge of castor oil was given, and the animal fasted for 24 hours afterward. A single dose of an emulsion made of equal parts of melted butter and warm water, containing a large number of tubercle bacilli, rubbed into a smooth paste, was then given by means of a stomach tube. Three and a half to four hours later the dog was

killed, and as much chyle as possible collected, together with the mesenteric glands. With this material guinea pigs were inoculated intraperitoneally. Microscopic examinations were made also. The entire intestine was then carefully examined after washing it out, and in two cases microscopic sections were made from several portions of the gut. In no instance could any lesion be detected.

Results. — The experiments were carried out on ten dogs, eight of which gave positive results. From these eight, 24 guinea pigs were inoculated. Of these 21 showed well marked tuberculosis, 1 was lost, and 2 remained well, showing no lesions whatever when chloroformed four months after inoculation. The microscopic diagnosis of the guinea pigs was in every instance confirmed by microscopic examination of sections. In only three cases could tubercle bacilli be demonstrated under the microscopic in the material from the dogs used for inoculantio.

The two dogs which gave negative results were the first two experimented upon. The probable explanation of failure in them is that the culture of tubercle bacillus used was of human origin which had long been used for making tuberculin, and was known to be of low virulence. The culture used was of the 142 generation. After this a bovine culture was employed, the generations being the 29th to the 33d.

In the light of these experiments we are warranted in concluding that under certain conditions tubercle bacilli pass through the normal intestinal wall with great facility and rapidity. The most favorable condition for this to take place appears to be during the digestion of food made up largely of fat. When we remember that the chyle is carried directly into the blood stream through the thoracic duct, it is easy to understand how it is that infection through food may show itself first in the lungs, or at any rate that the lesion in the lung may be as old as the intestinal lesion.

The claim that a food tuberculosis should show itself in a primary intestinal lesion is fallacious and misleading.

1. University of Penna. Medical Bulletin, May 1902.
2. Archives de Med. Exp. et d'Anatomnie Path. March 1, 1890, p. 253.
3. Comptes Rendus Soc. de Biologie, Vol. 47, 1895.
4. Ibid.
5. Journal de Phys. et Path. Generale, IV, 1902.

THE ETIOLOGY OF YELLOW FEVER. AN ADDENDUM.

By JAMES CARROLL,

First Lieutenant and Assistant Surgeon, U. S. Army, Washington, D. C.

In a paper entitled "The Etiology of Yellow Fever, a Supplemental Note,"[1] the Army Yellow Fever Board (which was then composed of the late Major Walter Reed, Surgeon, U. S. Army, and the writer,) stated that no results worthy of record had been obtained from the examination of infected mosquitoes either when dissected in the fresh state, or when studied in serial sections after being hardened and embedded. They also reported that two out of three non-immunes had been infected with yellow fever by the subcutaneous injection of 1.5 c.c. of

Figure 1. This is figure 15 from the report of Working Party No. 1, etc., and shows the fusiform bodies in the stomach and diverticulum of infected mosquitoes.

blood serum drawn from a yellow fever patient and subsequently passed through a new Berkefeld filter which was afterward found to be impervious to the *Micrococcus aureus*.

In the latter part of July of the present year there appeared from the government printing office the report of Working Party No. 1[2] of the Yellow Fever Institute of the U. S. Public Health and Marine Hospital Service. These observers, after repeating some of our experiments, presented additional confirmatory evidence in support of the mosquito theory of the transmission of yellow fever and in that respect

1. Read before the third annual meeting of the Society of American Bacteriologists, Chicago, Ills., December 31, 1901, and published in American Medicine, Philadelphia, February 22, 1902.

2. Report of Working Party No. 1, Yellow Fever Institute. A study of the Etiology of Yellow Fever, by Herman B. Parker, Assistant Surgeon, George E. Beyer, Acting Assistant Surgeon, O. L. Pothier, Acting Assistant Surgeon, March, 1908, Washington, Government Printing Office.

as well as in the negative results of their blood examinations their conclusions agreed with those of the army commission. They reported negative results, however, from two (subcutaneous?) inoculations with fresh yellow fever serum after it had been passed through a Berkefeld filter. The quantity of filtered serum injected in these experiments was in one instance one forty-fifth and in the other one-fifth of that used in our own cases.[1]

The most interesting and striking feature of the report was the description of a protozoan parasite to which the name *Myxococcidium stegomyiae* has been given. This parasite was found with regularity[2] in the appropriate mosquitoes that had bitten patients affected with

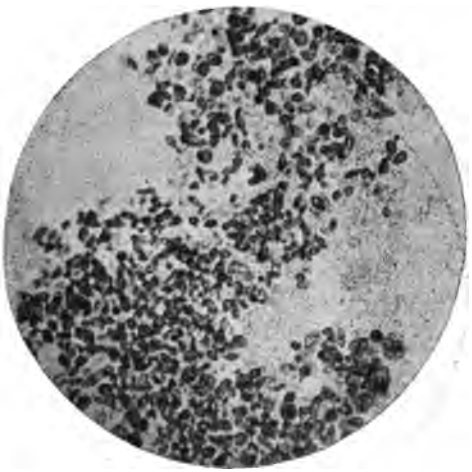

Figure 2. Photomicrograph, showing yeast cells in the diverticulum of a non-infected banana-fed insect from Havana. Spherical cells predominate but fusiform and budding (conjugating (?) cells are also shown. × 600.

yellow fever, these mosquitoes after varying periods being killed, sectioned and stained. Simple staining with Bismarck brown or hematoxylin were the methods used by these observers for the demonstration of the parasite. Five forms are described: (a) fusiform bodies found in the stomach and ventral diverticulum[3]; (b) fragmentation bodies lying in an albuminoid mass within the same diverticulum[4]; (c) compact aggregations of spores (called oöcysts) occurring in spherical masses[5] in similar albuminoid material in the same location; (b) sporoblasts (?) appearing as single or aggregated spherical or ovoid cells in the albuminous material in the diverticulum and in the tissues of

1. Reed and Carroll, American Medicine, February 22, 1902.
2. Report of Working Party No. 1. Conclusion 3, p. 8.
3. Fig. 15 of the Report.
4. Fig. 16 of the Report.
5. Figs. 17 to 24 of the Report.

the thorax[1]; (e) spores (?) containing sporozoites (?) in the salivary glands[2]. One or more of these stages were said to have been found in a large proportion of the infected mosquitoes that were killed not earlier than the third day after being fed upon the blood of patients during the second, third and fourth days of the disease. The cycle of development of these so-called animal parasites as given by the authors is about as follows. On the third or fourth day, after the disappearance of the blood, the stomach was found to contain varying numbers of small fusiform-shaped protozoa arranged singly or in groups and containing a central, oval nucleus. Certain of these forms (budding forms) were interpreted as indicating a terminal conjugation; after conjugation the resulting zygotes migrated through the stomach wall into the diverticulum and underwent further development in a

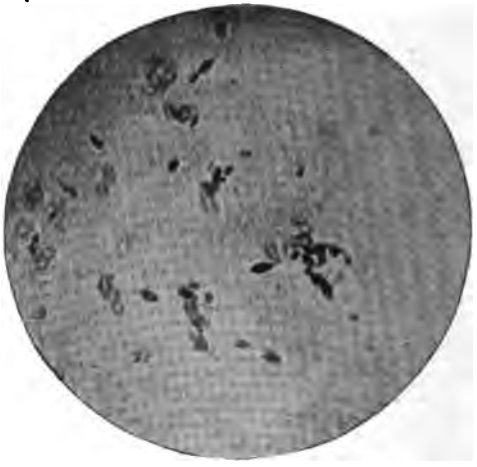

Figure 3. Photomicrograph, showing fusiform and budding cells in the diverticulum of another non-infected banana-fed insect from Havana. × 600. These mosquitoes were sectioned and examined early in 1901.

mass of albuminoid material in the latter sac. Here were found also the fragmentation bodies and oöcysts (?), the latter represented by rather compact spherical aggregations of round or ovoid bodies, the sporoblasts (?). After their liberation these sporoblasts wandered into the thoracic end of the diverticulum, passed through its wall and the tissues of the thorax until the salivary gland was reached. After penetration of the gland sporozoites were developed and liberated.

Availing myself of the announcement that type specimens were preserved in the collection of the Hygienic Laboratory of the U. S. Public Health and Marine Hospital Service, I requested permission

1. Figs. 25 to 28 of the Report.
2. Figs. 29 and 30 of the Report.

to examine them and I desire to acknowledge here the great courtesy and kindness extended to me on two such occasions by Dr. Herman B. Parker, the chairman of the Working Party. Upon subsequently re-examining our own sections of infected and non-infected mosquitoes which had already been studied more than two years before in conjunction with my honored colleague, the late Major Walter Reed, Surgeon, U. S. Army, and Dr. William M. Gray[1], Microscopist to the Army Medical Museum, I was unable to satisfy myself that a single one of our infected mosquitoes contained any of the fusiform, round or oval bodies described in the report of the Working Party of the Yellow Fever Institute, but forms similar in appearance to those shown in Fig. 16 of the report were occasionally found in the stomach contents. From their striking inequality in size and the absence of any structural details in these "fragmentation" forms I regarded them even in the type specimens above referred to as masses of amorphous granular ma-

Figure 4. Photomicrograph, showing the ellipsoid yeast obtained from banana. Deep colonies in an agar culture two days old. Stained by Gram's method. × 600.

terial. The bodies containing sporozoites[2] (?) which were found in the salivary gland have been abandoned by these investigators because they no longer regard them as of importance.[3]

It is noted that in a more recent article by the chairman of the Working Party all mention of these supposed sporozoites is omitted.[4] The report does not state in what relative number of insects each of these forms was seen, but I learned from Dr. Parker, upon inquiry, that the forms interpreted by them as fusiform protozoa were the only ones found to be constantly present. These are described as 3 to 4 μ

1. Practically all of our insects were embedded, cut and mounted by Dr. Cray.
2. Figs. 29 and 30 of the Report.
3. Dr. Herman B. Parker, Chairman of the Party is my authority for this statement.
4. The Etiology of Yellow Fever by Herman B. Parker, M. D., Journal of the Association of Military Surgeons, Vol. XIII, No. 4, October, 1903.

long by 1.5 to 2 μ broad, and containing a nucleus.[1] Appearances interpreted as evidence of conjugation are seen in certain of these forms where two of the ovoid bodies, varying more or less in size, are joined by a slender protoplasmic constriction[2] (see Fig. 1); others show a minute bud projecting from one or both poles. The nucleus appears as a small brightly refractive unstained spot when the bodies are stained with hematoxylin or Bismarck brown, either of which colors the whole cell. The bodies that impressed me as being of the greatest importance, if constantly present, were the oöcysts (?) in the albu-

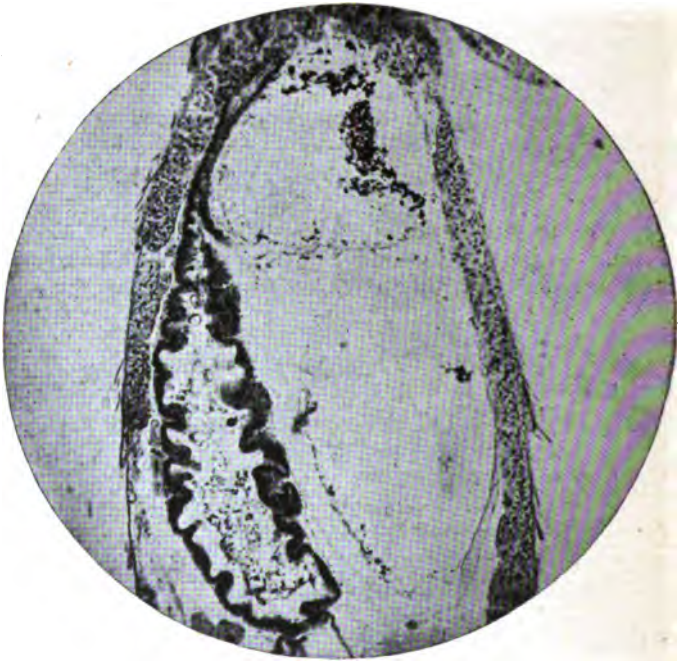

Figure 5. Photomicrograph, showing masses of yeast cells in the stomach and diverticulum of an insect fed on yeast culture and banana. Gram's method and Bismarck brown. Many of the yeast cells are decolorized and stained with Bismarck brown. × 50.

minoid mass (Fig. 23 of the Report) and the sporoblasts (?) (Figs. 27 and 28 of the Report) in the connective tissues of the thorax.

With these pictures fresh in mind, upon re-examining our slides prepared from infected mosquitoes I failed to find any of the forms described, excepting, of course, the "fragmentation" bodies (Fig. 16 of the Report) to which I could attach no significance. Upon re-examining sections of normal (non-infected) mosquitoes the result was different, for in one of these cut in cross section the ventral diverti-

1. Report of Working Party No. 1, etc., p. 31.
2. Loc. cit., Fig. 15

culum showed large numbers of spherical and fusiform cells, some of them corresponding in size and form to those described by the Working Party but stained brilliantly with eosin (see Fig. 2). The majority, however, were spherical and a few were elongated into large rod forms resembling detached hyphae. The smallest contained a single refractive spore, of minute size. The larger fusiform or flask-shaped bodies often contained several spores, and in a few instances a single spore was seen to have passed into a projecting bud of protoplasm. A few hyphal filaments about 2 to 3 μ broad and 15 to 20 μ long exhibited a central row of spores arranged with a fair degree of regularity. The characters described justified the conclusion that these cells were blastomycetes that had gained access to the body cavities of the insect with food or water.

In another non-infected insect cut in longitudinal section, fusiform, ovoid and flask-shaped cells (see Fig. 3) corresponding in every way with the fusiform stage of the *Myxococcidium stegomyiae* as seen in the type specimens, were found throughout the ventral diverticulum but were present in the upper portion of the stomach only, and away from the blood mass. This insect had been permitted to take a meal of normal blood some hours before it died, and it is of interest to note that the organisms were found not within or near the residual mass of ingested blood but only in the upper third of the stomach and associated with large numbers of bacteria. Their location suggests that instead of migrating through the wall of the stomach to the diverticulum[1] they were carried over mechanically from the diverticulum into the stomach.[2] The large majority of these cells showed a single central refractive vacuole (not spores in this instance) of minute size; a few contained two of them. Hyphal forms were not observed. The sections were stained originally with thionin and eosin upon a number of slides, and after decolorization the cells described were found also to stain perfectly with hematoxylin, Bismarck brown, (these two were the methods used by Parker, Beyer and Pothier) and by Gram's method. Similar results were obtained with smears from a culture of a white yeast kept in the laboratory. A week or so later I showed these slides to Drs. Parker and Rosenau of the Marine Hospital Service and expressed the opinion that the fusiform bodies were yeast cells.

In the endeavor to account for the presence of these bodies in our non-infected mosquitoes and their absence from those that had been infected it was recalled that the insects had been reared and kept in different buildings and fed differently for the greater part of the time

1. Report of Working Party No. 1, etc.., p. 29.

2. Accompanying the residual food supply, as indicated by Nuttall and Shipley, Studies in Malaria, Journal of Hygiene, Vol. III, No. 2, April 1903.

at least. The non-infected mosquitoes were supplied with banana; the infected insects referred to in this paper were at no time permitted to feed on fruit but were given only sugar and water in separate vessels. Many of the infected insects were reared under these conditions. I can speak positively upon this point because from the establishment of Camp Lazear until its abandonment, the infected mosquitoes kept there were under my exclusive charge and control.

To establish, if possible, the connection between over-ripe fruits and the presence of these bodies in mosquitoes I obtained some *Stegomyiae* through the courtesy of Dr. Edmond Souchon of New Orleans, and Dr. L. O. Howard of the U. S. Department of Agriculture, the latter kindly supplying me with fifty living insects, a large number of eggs and some insects preserved in alcohol. Fusiform yeast cells were found in the diverticula of a very small proportion of those that were

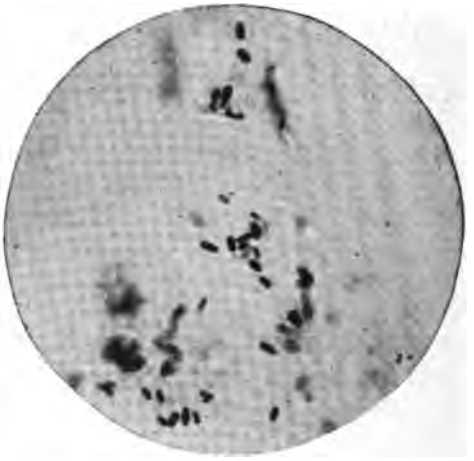

Figure 6. The same. A field from the diverticulum. × 600.

received in alcohol. An ellipsoid wild yeast (see Fig. 4) was then isolated from an old banana and insects were subsequently fed upon the fermenting fruit to which this yeast in pure culture had been added. Previous sterilization of the banana was not considered necessary. As a result I have brought about the presence of bodies identical in appearance with the fusiform stage of the so-called *Myxococcidium stegomyiae* in nearly fifty insects that have never been in contact with a case of yellow fever and have demonstrated them, in large numbers, in the diverticula of four *male* insects that have been hatched and reared in the laboratory of the Surgeon General's Office in Washington. I have been able to demonstrate the passage of these organisms from the ventral diverticulum through the natural opening of

communication to the oesophagus and thence to the stomach, where they are found only in the upper part of the organ, and are absent from the blood mass below, which is of large size and recently ingested. I have obtained in one instance as the result of feeding a male insect upon wild yeast and banana, sections which show these organisms among the muscular tissues of the thorax and many of them lie in close proximity to the gland. Several insects similarly treated show the same bodies in the stomach and diverticula (see Figs. 5, 6 and 7). They have not been found in fifty-two *Stegomyiae* fed upon yellow fever patients and kept under my immediate charge, a number of them having been used in reproducing the disease. Many of these mosquitoes that were kept for inoculation purposes died in the jars and are poorly preserved, but a number were killed and preserved immediately. The state of preservation of the insect, however, does not materially affect the staining properties of the blastomycetes, for in non-infected insects that have died in the jars and are crowded with bacteria, they color brilliantly and sharply. This would seem to indicate that they still retain their vitality after the death of the mosquito containing them.

Dr. L. O. Howard informs me that Dr. J. W. Dupree of Baton Rouge, La., writes him that he also finds *"Myxococcidium stegomyiae"* in non-infected mosquitoes at Baton Rouge.

Indirect confirmation of my results is seen in the Report cited[1] where it is stated that the parasite was not found in *Stegomyiae* that had been applied to a malignant case of malarial fever and were then fed upon blood, sugar and water. If a sufficient number of insects had been used and they had been fed upon over-ripe banana or other fruit as the Working Party recommends for yellow fever mosquitoes,[2] the supposed animal parasites would in all probability have been demonstrated.

Upon close examination of the liberated sporoblasts (?) shown ir Figs. 25 and 26 of the Report referred to,[3] it will be seen that these bodies show the variations in size and form and the typical budding processes of yeast cells. This is particularly well marked in the left central and lower portions of figure 26.

That ellipsoid wild yeasts may be pathogenic for the lower animals is shown by the researches of Rabinowitch,[4] who states also that these cells are stained by all the usual aniline colors. In the course of my observations it has been found that typical ellipsoid forms in one of

1. Report of Working Party No. 1, etc., p. 80.
2. Report of Working Party No. 1, etc., p. 28.
3. Report of Working Party No. 1, etc.
4. Zeitschrift fur Hygiene etc., Vol. 21, 1896, p. 11.

the mosquitoes were stained equally well with eosin, Bismarck brown, hematoxylin and by Gram's method.

Similar forms of blastomycetes have already been isolated from the broken down nodules of spurious glanders and the statement is made by Italian investigators that several parasites which are classified under the sarco or micro-spordia belong really to the blastomycetes.[1]

As the yeasts are universally disseminated in nature (and there are many species of them, only a relatively small number being pathogenic), it is not surprising that experiments with a single species have failed to show positive evidences of invasion of the tissues of the insect. This was obtained by the Working Party of the Marine Hospital Service in only a few instances, and is obviously of no importance from the point of view of the etiology of yellow fever. On the other

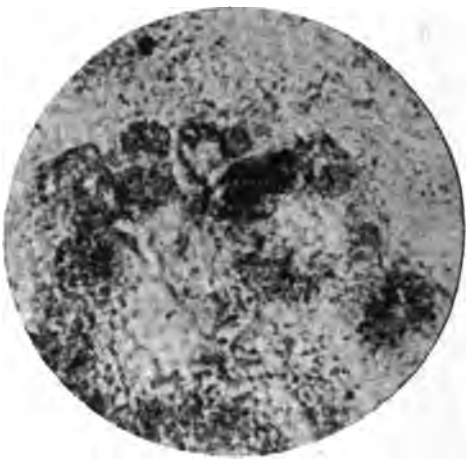

Figure 7. Colonies in the albuminoid mass in the diverticulum of a yeast-fed insect. Bismark brown. × 600.

hand it is regarded as of the greatest importance that bodies apparently identical with the fusiform stage of this supposed protozoan, the only form found to be constantly present, can be easily reproduced anywhere by feeding to mosquitoes a culture of an ellipsoid yeast.

The results of the observations here recorded are believed to justify the following conclusions:

1. The fusiform stage of the so-called *Myxococcidium stegomyiae* of Parker, Beyer and Pothier, (1903) is not connected in any way with the transmission of yellow fever.

1. A new pathogenic species of yeast etc., Fermi and Aruch, Centralblatt fur Bakt., etc., 1st Abt., Vol. XVII, No. 17, May, 1895, p. 698.

2. This organism appears to be not a protozoan parasite but a yeast fungus. In its fusiform stage, the only form in which it was constantly present, it shows the characteristic budding, staining affinities and vacuolation or spore formation of a blastomycete, and it is found with considerable regularity in both male and female mosquitoes that have purposely been fed upon over-ripe banana to which a pure culture of a wild yeast had been added in the laboratory.

3. The organism has not hitherto been found in repeated examinations of mosquitoes of the genus *Stegomyia* that have bitten yellow fever patients in the early stages of the disease, such insects having been fed only upon blood, dry sugar and water. This statement applies also to mosquitoes that are known to have reproduced the disease in human beings.

REPORT OF THE COMMITTEE ON RESOLUTIONS ON THE DEATH OF DR. WYATT JOHNSTON.

On June 19, 1902, the American Public Health Association, and especially its Section of Bacteriology and Chemistry, suffered a severe loss in the death of Dr. Wyatt Johnston, of Montreal.

His death was due to septic poisoning acquired in the autopsy room of the Montreal General Hospital. In February last a streptococcus inoculation of his hand incapacitated him for work for a few weeks. In April, after returning to his duties, he probably received a second infection. The affection then became more extended, and he was removed to a private ward in the General Hospital. Death resulted on June 19 from a pulmonary embolism.

Dr. Wyatt Galt Johnston was a son of the late Dr. J. B. Johnston, of Sherbrooke, Que. He was born about forty years ago, received his early education at Bishop's College and was graduated in medicine from McGill University in 1884. He made several extended visits abroad, working for some months at several of the most prominent pathological laboratories of Europe.

In 1895 he married Julia, daughter of the late Michael Turnor, of Rugely, England.

The professional and scientific career of Dr. Johnston was a varied one, covering an unusually wide range of work, as is shown by the important official positions which he so successfully occupied. Immediately after his graduation in medicine he became Resident Medical Officer in the Montreal General Hospital, serving for about one year. For several years thereafter he was Demonstrator in Pathology at McGill, and alone he gave all the lectures and demonstrations in this department. After his resignation from the pathological department of McGill he still continued his work in the General Hospital, but devoted himself almost exclusively to bacteriology and to medico-legal work. In the latter fields he held important official positions as Bacteriologist to the Provincial Board of Health of Quebec and as Medico-legal Expert for the District of Montreal. Shortly after his appointment to the latter position he was made Lecturer in Bacteriology at McGill, and in 1897 he was appointed Assistant Professor in Public Health and Lecturer in Medico-legal Pathology. Only a few months before his death he received the Chair of Hygiene and Director of that department in the Faculty of Medicine in McGill University, a position which he had practically occupied during the past two years.

As an investigator his work was chiefly characterized by originality, directness of method and versatility. His was an eminently practical mind, and his powers of obtaining sound results by the simplest and most direct means were of a very high order. As a worker he was indefatigable. Combining this with his concentration and rapidity of thought, his knowledge of the practical merit of the foremost publications in his several fields of labor was very valuable. Those who knew him well recall many instances where his inventive genius simplified and facilitated to a great degree the routine work of laboratory methods of instruction and demonstration.

A partial list of his writings shows that he contributed more than fifty important articles to scientific literature in leading medical and sanitary journals, in the fields of pathology, hygiene and medical jurisprudence. By some of his friends in the Association it perhaps may not be realized that in the latter field he contributed a number of his most thorough and important papers. He had a high reputation as a reliable and scientific medical jurist and expert, and this was by no means confined to Montreal or to America.

Dr. Johnston joined the American Public Health Association in 1892, and was a liberal contributor on matters dealing with the application of bacteriology in its various relations to public health. He was of course best known to us as the originator of two movements, which, taken together, may be fairly said to mark an epoch in the affairs of the Association. It was he who conceived the idea of testing laboratory methods in several different laboratories, taking up special species or groups of bacteria in order, and jointly working out their characteristics thoroughly and in a manner to show clearly where improvements were needed and how such improvements could best be made. His frequent discussions of this idea with his colleagues at McGill resulted in the formal presentation to the Association at the meeting in Montreal in 1894 by Dr. Adami of a communication which became the starting point in this country of the coöperative and systematic improvement of laboratory methods as applied to sanitary work. As is well known, it resulted in the Bacteriological Convention held in New York in June, 1895, and next in the report of a committee on laboratory procedures which was published by the Association in 1897. While these important matters were taking concrete form, Dr. Johnston's views of putting the idea into more efficient practice were being developed, with the result that he organized the movement which terminated in the present Section of Bacteriology and Chemistry. He may properly be called the father of this Section, and it was he more than anyone else to whom credit is due for its conception and establishment.

Sanitary scientists owe to Dr. Johnston still another debt of gratitude, coming from his progressive views in relation to the teaching of public health matters, as it was largely through his efforts that McGill University was the first on this continent to offer the Diploma of Public Health, and to establish courses leading thereto.

The appointment by the Association of a standing committee on "The teaching of hygiene and granting of diploma of Doctor of Public Health" was due solely to his initiative. He was very active in his work on this committee, of which he was chairman at the time of his death. This movement is very important, and one which is thoroughly worthy of being fostered by the Association.

The Laboratory Section deeply mourns his untimely death in the full prime of his intellectual vigor, and will greatly miss his charming personality, with his ready wit and sympathy, which made for him so many friends among our members.

This committee desires to make acknowledgments to his confreres at McGill, Professors Adami and Ruttan, for information from which the above obituary notice was prepared, and begs leave to offer the following resolutions:

That the members of the American Public Health Association desire formally to record their sorrow at the untimely death of Dr. Wyatt Johnston.

That they recognized in him a cultivated gentlemen, a delightful and entertaining companion, a sound, original and versatile investigator, whose efforts did much to increase the efficiency and dignity of sanitary science as applied to matters pertaining to the public health.

That they are deeply indebted to him, especially for his originating and organizing the Laboratory Section of Bacteriology and Chemistry, credit for which movement, notwithstanding his characteristic modesty and aversion to honors, was almost solely due to him, and at the meetings of which the absence of his inspiring and stimulating presence will be deeply mourned by his many friends in the Association.

That they transmit a copy of these resolutions to his family and the faculty of McGill University, with their heartfelt sympathy in the great loss which they have suffered.

CONSTITUTION

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

TITLE.

I. This Association shall be called "THE AMERICAN PUBLIC HEALTH ASSOCIATION."

OBJECTS.

II. The objects of the Association shall be the advancement of sanitary science, and the promotion of organizations and the measures for the practical application of public hygiene.

MEMBERS.

III. The members of this Association shall be known as Active and Associate. The Executive Committee shall determine for which class a candidate shall be proposed. The *Active* members shall constitute the permanent body of the Association, subject to the provisions of the constitution as to continuance in membership. They shall be selected with special reference to their acknowledged interest in, or devotion to, sanitary studies and allied science, and to the practical application of the same. The *Associate* members shall be elected with special reference to their general interest only in sanitary science, and shall have all the privileges and publications of the Association, but shall not be entitled to vote.

Delegates from national, state, provincial, and municipal boards of health, organized sanitary associations, and the army, navy, and marine hospital service, shall be entitled to be enrolled as active members upon presentation of their credentials to the Executive Committee. Members, not delegates from such bodies, shall be elected as follows:

Each candidate for admission shall first be proposed to the Executive Committee, in writing (which may be done at any time), with a statement of the business or profession and special qualifications of the person so proposed. On recommendation of a majority of the committee, and on receiving a vote of two-thirds of the members present at the regular meeting the candidate shall be declared duly elected a member of the Association. The annual fee of membership in either class shall be five dollars.

OFFICERS.

IV. The officers shall be a President, a First and Second Vice-President, a Secretary, and a Treasurer, and the officers of the various sections.

All the officers shall be elected by ballot, annually, except the Secretary, who shall be elected for a term of three years.

PRESIDING OFFICER.

V. The President, or in his absence one of the Vice-Presidents, or in their absence a chairman pro tempore, shall preside at all meetings of the Association. He shall preserve order, and shall decide all questions of order, subject to appeal to the Association. He shall also appoint all committees authorized by the Association, unless otherwise specially ordered.

SECRETARY.

VI. The Secretary shall have charge of the correspondence and records of the Association; and he shall also perform the duties of Librarian. He, together with the presiding officer, shall certify all acts of the Association. He shall, under the direction of the Executive Committee, give due notice of the time and place of all meetings of the Association, and attend the same. He shall keep fair and accurate records of all the proceedings and orders of the Association; and shall give notice to the several officers, and to the Executive and other committees, of all votes, orders, resolves, and proceedings of the Association, affecting them or appertaining to their respective duties.

TREASURER.

VII. The Treasurer shall collect and take charge of the funds and securities of the Association. Out of these funds he shall pay such sums only as may be ordered by the Association, or by the Executive Committee. He shall keep a true account of his receipts and payments, and at each annual meeting render the same to the Association, when a committee shall be appointed to audit his accounts. If, from the annual report of the Treasurer, there shall appear to be a balance against the treasury, no appropriation of money shall be made for any object but the necessary current expenses of the Association, until such balance shall be paid.

STANDING COMMITTEES.

VIII. There shall be the following standing committees: (1) The Executive Committee, (2) the Advisory Council, (3) the Committee on Publication.

EXECUTIVE COMMITTEE.

IX. The Executive Committee shall consist (1) of the President, First Vice-President, Second Vice-President, Secretary, Treasurer, and Chairmen of the various sections; (2) of six active members of whom three shall be elected annually by ballot to serve two years, and who shall be ineligible to reëlection for a second successive term; (3) of the ex-presidents of the Association; and (4) of the Chairman and Secretary of the Laboratory Section and the retiring chairman of that section.

It shall be the duty of the Executive Committee to consider and recommend plans for promoting the objects of the Association, to authorize the disbursement and expenditure of unappropriated moneys in the treasury for the payment of current expenses; to consider all applications for membership, and at the regular meetings, report the names of such candidates as a majority shall approve; and, generally, to superintend the interests of the Association and execute all such duties as may, from time to time, be committed to them by the Association. At least one month preceding the annual meeting of the Association, the Executive Committee shall cause to be issued to members a notice of such meeting, and they are authorized to publish the same in medical, scientific, and other periodicals, but without expense to the Association; and such notice shall contain the order of business to be followed at said meeting, and briefly, the subjects to be presented and the special points of discussion.

ADVISORY COUNCIL.

X. The Advisory Council shall consist of one member from each state, territory, and district, the army, navy, and marine hospital service, the Dominion of Canada, and each of the provinces, who shall be appointed by the President on the last day of each session, and who, besides acting as nominating committee of officers for the ensuing year, to be announced at such time as the Executive Committee may appoint, shall consider such questions and make such recommendations to the Association as shall best secure the objects of the Association. They shall at their first meeting elect from their own number a secretary, whose record of their proceedings shall be made part of the records of the Association.

COMMITTEE ON PUBLICATION.

XI. The Committee on Publication shall consist of a Chairman, the Secretary of the Association, the Treasurer of the Association, and a member of each section of the Association, with the President

of the Association, *ex-officio;* who shall contract for, arrange and publish, under authority of the Executive Committee, the proceedings of the Association, including such papers as have been examined and approved by the Executive Committee, or which have been submitted to them by the latter for their discretionary action.

REPORTS AND PAPERS.

XII. All committees preparing reports to be presented to the Association must submit the same to the Publication Committee not later than 30 days before the succeeding annual meeting of the Association; and all papers other than committee reports shall be in the hands of the Secretary not less than 20 days before.

MEETINGS.

XIII. The time and place of each annual meeting shall be fixed at the preceding annual meeting, but may be changed by the Executive Committee for reasons that shall be specified in the announcement of the meeting. Special meetings may be called at any time or place, by concurrence of two-thirds of the Executive Committee. There shall be no election of officers, or change of by-laws, or appropriation of money to exceed the amount at that time in the treasury, at such special meeting, except by a vote of a majority of all the members of the Association. Whenever a special meeting is to be held, at least one month's notice shall, if possible, be given by circular to all the members, together with the order of business.

QUORUM.

XIV. At the annual meeting nine members shall constitute a quorum for the election of officers, a change of the constitution, the election of members, and the appropriation of moneys.

ORDER OF BUSINESS.

XV. The order of business at all meetings of the Association shall be fixed by the Executive Committee, and such order must be completed before any other business is introduced, except such order of business is suspended by a vote of four-fifths present.

ALTERATION OF CONSTITUTION.

XVI. No alteration in the constitution of the Association, shall be made except at an annual meeting, or unless such alteration shall have been proposed at a previous meeting, and entered on the minutes with the name of the member proposing the same, and shall be adopted by a vote of two-thirds of the members present.

SECTIONS.

XVII. Members of the Association may be authorized to form themselves into sections by vote of the Association at any annual meeting; such sections shall have power to nominate their officers to be elected by the Association, and to make by-laws which shall go into effect when approved by the Association.

BY-LAWS OF THE EXECUTIVE COMMITTEE.

QUORUM.

1. Five members shall constitute a quorum for the transaction of such business as may come before the committee.

MEMBERS RESTRICTED.

2. No elective member of the Executive Committee shall be at the same time a member of the Advisory Council, if there is another member of the Association from his state or service.

PARLIAMENTARY USAGE.

3. Cushing's Law and Practice of Legislative Assemblies shall be the guide in parliamentary practice until otherwise ordered.

PAPERS.

4. Papers to be presented at a general session of the Association shall be in the hands of the Secretary of the Association not less than twenty days before the coming meeting, and to be printed in the transactions in full or in abstract at the discretion of the Publication Committee.

5. All papers accepted by the Association, whether read in full, by abstract, by title, or filed, shall be delivered to the Secretary as soon as thus disposed of, as the exclusive property of the Association. Any paper presented to this Association and accepted by it shall be refused publication in the transactions of the Association, if it be published, in whole or in part, by permission or assent of its author, in any manner prior to the publication of the volume of transactions, unless written consent is obtained from the Publication Committee.

6. Day papers shall be limited to twenty minutes, and evening papers to thirty minutes each.

DISCUSSION OF PAPERS.

7. After the leading papers on each subject, as indicated by the Executive Committee, have been read, discussion shall follow, and be confined strictly to the subject of these papers; and each speaker shall be limited to ten minutes, and shall not speak a second time until after every other member who desires to be heard, and then only for five minutes, except by unanimous consent.

8. The Chair shall notify gentlemen who desire to speak to send their names, and they shall be called on in the order sent up; and he may, at his discretion, limit the time of speaking to five instead of ten minutes, if in his judgment it may become necessary to do so in order to allow each one on the list an opportunity to be heard.

PUBLICATION COMMITTEE.

9. The Publication Committee shall consist of a Chairman, the Secretary of the Association, the Treasurer of the Association, and a member of each section of the Association, with the President of the Association *ex-officio*.

10. Unless otherwise ordered by the Association, such committee is hereby instructed to keep the size of the annual transactions within the limits of four hundred pages; and to this end to conform to the several following rules:

a. Make summaries of such local and other addresses as are not of permanent scientific value.

b. The Chairman of the several Standing Committees shall be notified by the Secretary that the reports to be presented by them shall include any material prepared by the several members of their committees and must be in the hands of the Publication Committee not later than thirty days before the succeeding annual meeting for preliminary printing.

c. Such reports shall be printed for distribution to the members on registering at the coming meeting; but no report shall be printed unless in the hands of the Publication Committee, as specified above.

11. The Publication Committee shall procure a copyright on the transactions in the name of the Association, and the committee shall have full charge of the publication of the transactions.

APPLICATION FOR MEMBERSHIP.

12. All applications for membership must be made upon the application blank of the Association.

13. Persons not members, having prepared papers to be presented at the meetings of the Association, shall be proposed for membership at the first business meeting of the Association.

EXPENDITURES.

14. All bills connected with the publication of the transactions shall, upon the approval of the chairman of the Publication Committee and the Secretary, be signed by the president of the Association, and paid by check of the Treasurer directly to the party concerned; and the President shall not approve any bill, relating either to publish-

ing or printing, without the approval first of the chairman of the committee in charge thereof.

15. Bills for current expenses shall be first approved by the Secretary, then sent to the President, and on his approval they shall be paid by check of the Treasurer directly to the parties interested.

16. The actual and necessary traveling expenses of the Secretary and Treasurer to the annual meeting of the Association, and to one meeting of the Executive Committee, shall be classed as current expenses.

RESOLUTIONS.

17. All resolutions presented to the Association shall be sent to the Chair in writing, and referred to a committee without discussion.

ARREARAGES.

18. The arrearages of all members remitting their dues for two years shall be cancelled up to the date of the last payment, but they shall be entitled to the transactions of the Association only for the years for which they have actually paid.

AUDITING COMMITTEE.

19. An Auditing Committee shall be appointed by the Chair to audit the accounts of the Treasurer, and report upon the same.

OFFICERS AND COMMITTEES

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

OFFICERS 1903-1904.

President .....Dr. Carlos J. Finlay, Havana, Cuba.
First Vice-President .....Dr. Jesus E. Monjaras, Mexico, Mexico.
Second Vice-President ..... Dr. William C. Woodward, Washington, D. C.
Secretary .....Dr. Charles O. Probst, Columbus, Ohio.
Treasurer, ...Dr. Frank W. Wright, New Haven, Conn.

PRESIDENTS OF THE ASSOCIATION.

Stephen Smith, M. D.....1872, '73, '74
*Joseph M. Toner, M. D..... 1875
*Edwin M. Snow, M. D..... 1876
*John H. Rauch, M. D..... 1877
*Elisha Harris, M. D..... 1878
*James L. Cabell, M. D..... 1879
John S. Billings, M. D..... 1880
*Charles B. White, M. D..... 1881
*Robert C. Kedzie, M. D..... 1882
*Ezra M. Hunt, M. D..... 1883
*Albert L. Gihon, M. D..... 1884
*James E. Reeves, M. D..... 1885
Henry P. Walcott, M. D..... 1886
George M. Sternberg, M. D..... 1887
Charles N. Hewitt, M. D..... 1888
*Hosmer A. Johnson, M. D..... 1889
Henry B. Baker, M. D..... 1890
Frederick Montizambert, M. D..... 1891
Felix Formento, M. D..... 1892
Samuel H. Durgin, M. D..... 1893
Emmanuel P. Lachapelle, M. D..... 1894
William Bailey, M. D..... 1895
Eduardo Liceaga, M. D..... 1896
*Henry B. Horlbeck, M. D..... 1897
Charles A. Lindsley. M. D..... 1898
*George H. Rohe, M D..... 1899
Henry Mitchell, M. D..... 1899
Peter H. Bryce, M. D..... 1900
Benjamin Lee, M. D..... 1901
Henry D. Holton, M. D..... 1902
Walter Wyman, M. D..... 1903

* DECEASED.

STANDING COMMITTEES.

EXECUTIVE COMMITTEE.

[The Officers and Ex-Presidents of the Association and the Chairman, Secretary and retiring Chairman of the Laboratory Section are ex-officio members of the Executive Committee.]

DR. JOHN S. FULTON.....Baltimore, Md.
DR. JOSE RAMIREZ.....Mexico, Mex.
DR. JOHN A. AMYOT.....Toronto, Ont.
DR. A. H. DOTY.....Quarantine, S. I., N. Y.
DR. JOHN LAINY LEAL.....Paterson, N. J.
PROF. F. C. ROBINSON.....Brunswick, Me.

PUBLICATION COMMITTEE.

DR. JOSIAH HATZELL.....Canton, Ohio.
DR. C. O. PROBST.....Columbus, Ohio.
DR. FRANK W. WRIGHT.....New Haven, Conn.
DR. HERBERT D. PEASE.....Albany, N. Y.

ADVISORY COUNCIL.

UNITED STATES:

Alabama .....
Alaska .....
Arkansas .....
Arizona .....
California .....Dr. A. J. RICE, *San Francisco.*
Colorado .....
Connecticut .....Dr. L. P. JONES, *Greenwich.*
Delaware .....W. C. R. COLQUHOUN, *Wilmington.*
Florida .....Dr. J. Y. PORTER, *Jacksonville.*
Georgia .....
Hawaii .....
Idaho .....
Illinois .....Dr. ADOLPH GEHRMANN, *Chicago.*
Indiana .....Dr. J. N. HURTY, *Indianapolis.*
Iowa .....Dr. J. C. SHRADER, *Iowa City.*
Kansas .....
Kentucky .....Dr. WILLIAM BAILEY, *Louisville.*
Louisiana .....Dr. C. P. WILKINSON, *New Orleans.*
Maine .....Dr. G. M. WOODCOCK, *Bangor.*
Maryland .....Dr. JOHN S. FULTON, *Baltimore.*
Massachusetts .....Dr. S. H. DURGIN, *Boston.*
Michigan .....HENRY A. HAIGH, ESQ., *Detroit.*
Minnesota .....Dr. H. M. BRACKEN, *St. Paul.*
Mississippi .....Dr. H. McM. FOLKES, *Biloxi.*
Missouri .....Dr. D. T. POWELL, *Thayer.*
Montana .....

Nebraska .....
Nevada .....
New Hampshire .....Dr. G. P. CONN, *Concord.*
New Jersey .....Dr. JOHN LAINY LEAL, *Paterson.*
New Mexico .....
New York .....Dr. JOSEPH H. RAYMOND, *Brooklyn.*
North Carolina .....Dr. R. H. LEWIS, *Raleigh.*
North Dakota .....Dr. H. D. QUARRY, *Grand Forks.*
Ohio .....Dr. W. C. CHAPMAN, *Toledo.*
Oklahoma Territory.....
Oregon .....
Pennsylvania .....Dr. BENJ. LEE, *Philadelphia.*
Philipine Islands .....
Porto Rico .....Dr. WILLIAM FAWCETT SMITH, *San Juan.*
Rhode Island .....Dr. C. V. CHAPIN, *Providence.*
South Carolina .....Dr. CHARLES M. REES, *Charleston.*
South Dakota .....
Tennessee .....Dr. MARCUS HAASE, *Memphis.*
Texas .....Dr. J. H. SMART, *Dallas.*
Utah .....
Vermont .....Dr. C. S. CAVERLY, *Rutland.*
Virginia .....
Washington .....Dr. JAMES B. EAGLESON, *Seattle.*
West Virginia .....Dr. JAMES H. BROWNFIELD, *Fairmont.*
Wisconsin .....H. L. RUSSELL, *Madison.*
Wyoming .....
District of Columbia....Dr. WILLIAM C. WOODWARD, *Washington.*
U. S. Army.....Dr. A. N. STARK, *West Point, N. Y.*
U. S. Navy.....Dr. JOHN W. ROSS, *Washington, D. C.*
U. S. P. H and M. H.
Service .....Dr. HENRY R. CARTER, *Baltimore, Md.*

CANADA:

Dominion of Canada....Dr. FREDERICK MONTIZAMBERT, *Ottawa.*
British Columbia .....Dr. J. C. FAGAN, *Victoria.*
Manitoba .....Dr. JOHN A. MACDONALD, *Brandon.*
New Brunswick .....Dr. E. BAYARD FISHER, *Fredericton.*
Nova Scotia .....
Ontario .....Dr. J. A. AMYOT, *Toronto.*
Quebec .....Dr. E. P. LACHAPELLE, *Montreal.*

CUBA.

Republic of Cuba .....Dr. CARLOS FINLAY, *Havana.*

MEXICO.

Aguas Calientes .....Dr. JOSE RAMIREZ, *Mexico, D. F.*
Campeche .....Dr. DOMINGO ORVANANOS, *Mexico, D. F.*
Colima .....Dr. LUIS E. RUIZ, *Mexico, D. F.*
Coahulia .....Dr. DAVID CERNA, *Saltillo.*
Chihuahua .....Dr. MIGUEL MARQUEZ, *Chihuahua.*
Chiapas .....
Durango .....Dr. JOSE L. GOMEZ, *Mexico, D. F.*

Guanajuato .....Dr. JESUS CHICO, *Guanajuato City.*
Guerrero .....Dr. GONZALES FABELA, M. D., *Mexico, D. F.*
Hidalgo .....Dr. RAMON PRADO, *Mexico, D. F.*
Jalisco .....Dr. JESUS GONZALES URENA, *Mexico, D. F.*
Michoacan ..... Dr. ULISES VALDES, M. D., *Mexico, D. F.*
Morelos .....Dr. FERNANDO LOPEZ, *Mexico, D. F.*
Mexico .....Dr. IGNACIO GUZMAN, *Toluca.*
Nuevo Leon .....Dr. PEDRO NORIEGA, *Monterey.*
Oaxaca ..... Dr. ADELBERTO CARRIEDO, *Oaxaca.*
Puebla .....Dr. J. JOAQUIN URRUTIA, *Puebla.*
Queretaro .....Dr. AUGUSTIN RUIZ OLLOGUI, *San Juan del Rio Qro.*
San Luis Potosi.....Dr. JESUS E. MONJARAS, *San Luis Potosi.*
Sonora .....Dr. ANGEL GAVINO, *Mexico, D. F.*
Sinaloa .....Dr. NARCISO DEL RIO, *Veracruz.*
Tabasco .....Dr. GONZALES FABELA, *Mexico, D. F.*
Tamaulipas .....Dr. MANUEL URIBE TRONCOSO, M. D., *Mexico, D. F.*
Tlaxcala .....Dr. JOSE GAYON, *Mexico, D. F.*
Veracruz .....Dr. MANUEL IGLESIAS, *Veracruz.*
Yucatan .....Dr. FRANCES DE P. LEAL, M. D., *Mexico, D. F.*
Zacatecas .....Dr. JUAN BRENA, *Zacatecas.*
Territorio de la Baja California .....
Territorio de Tepic ....
Distrito Federal .....Dr. EDUARDO LICEAGA, *Mexico, D. F.*

SPECIAL COMMITTEES.

PURIFICATION AND PRESERVATION OF WATER SUPPLIES.

George W. Fuller.....New York, N. Y.
George C. Whipple.....New York, N. Y.
Allen Hazen, C. E.....New York, N. Y.
Marshall O. Leighton.....Washington, D. C.
Robert Spurr Weston.....Boston, Mass.
Harry W. Clark.....Boston, Mass.
J. C. Perry, M. D.....Washington, D. C.

DISPOSAL OF SEWAGE AND INDUSTRIAL WASTES.

Dr. Gardner T. Swarts.....Providence, R. I.
Rudolph Hering, C. E.....New York, N. Y.
Edwin O. Jordan.....Chicago, Ill.
Leonard P. Kinnicutt, S. D.....Worcester, Mass.
Geo. H. Benzenberg, C. E.....Milwaukee, Wis.
John W. Alvord, C. E.....Chicago, Ill.
John P. Force, C. E.....Columbus, Ohio.
W. F. Morse, S. E.....New York, N. Y.

ANIMAL DISEASES COMMON TO MAN.

D. E. Salmon, D. V. M.....Washington, D. C.
Leonard Pearson, V. M. D.....Philadelphia, Pa.
Veranus A. Moore, M. D.....Ithaca, N. Y.
Irving A. Watson, M. D .....Concord, N. H.
Jose L. Gomez, M. D.....Mexico, Mex.

ETIOLOGY OF YELLOW FEVER.

John W. Ross, M. D.....Washington, D. C.
Eduardo Liceaga, M. D.....Mexico, Mex.
Juan Guiteras, M. D.....Havana, Cuba.
Henry R. Carter, M. D.....Baltimore, Md.
Paul E. Archinard, M. D.....New Orleans, La.
William C. Gorgas, M. D.....Washington, D. C.
Carlos J. Finlay, M. D.....Havana, Cuba.
M. J. Rosenau, M. D.....Washington, D. C.

TUBERCULOSIS.

Lawrence F. Flick, M. D.....Philadedphia, Pa.
Marshall Langton Price, M. D.....Baltimore, Md.
C. O. Probst, M. D.....Columbus, Ohio.
M P. Ravenel, M. D.....Philadelphia, Pa.
Jas. A. Burroughs, M. D.....Asheville, N. C.

PLAGUE.

A. H. Doty, M. D. ..... Quarantine, S. I., N. Y.
J. J. Kinyoun, M. D. ..... Glenolden, Pa.
C. J. Fagan, M. D. ..... Victoria, B. C.
H. D. Geddings, M. D. ..... Washington, D. C.

DEMOGRAPHY AND STATISTICS IN THEIR SANITARY RELATION.

William A. King. ..... Washington, D. C.
Cressy L. Wilbur, M. D. ..... Lansing, Mich.
John S. Fulton, M. D. ..... Baltimore, Md.
H. M. Bracken, M. D. ..... St. Paul, Minn.
Jesus E. Monjaras, M. D. ..... Mexico, Mex.
F. L. Hoffman ..... Newark, N. J.

INFECTIOUS PERIOD OF COMMUNICABLE DISEASES.

S. H. Durgin, M. D. ..... Boston, Mass.
William H. Welch, M. D. ..... Baltimore, Md.
Juan Brena, M. D. ..... Zacatecas, Mex.
Quitman Kohnke, M. D. ..... New Orleans, La.

PUBLIC HEALTH LEGISLATION.

A. G. Young, M. D. ..... Augusta, Me.
Jose Ramirez, M. D. ..... Mexico, Mex.
E. P. Lachapelle, M. D. ..... Montreal, P. Q.
Preston H. Bailhache, M. D. ..... Stapleton, N. Y.

CAUSES AND PREVENTION OF INFANT MORTALITY.

William C. Woodward, M. D. ..... Washington, D. C.
J. C. Shrader, M. D. ..... Iowa City, Iowa.
J. A. Egan, M. D. ..... Springfield, Ill.
J. Joaquin Urrutia, M. D. ..... Puebla, Mex.

DISINFECTION AND DISINFECTANTS.

Prof. F. C. Robinson, ... Brunswick, Me.
Hibbert W. Hill, M. D. ..... Boston, Mass.
H. D. Pease, M. D. ..... Albany, N. Y.
Charles V. Chapin, M. D. ..... Providence, R. I.
Luis E. Ruiz, M. D. ..... Mexico, Mex.

TEACHING OF HYGIENE AND GRANTING OF DIPLOMA OF PUBLIC HEALTH.

Geo. M. Sternberg, M. D. ..... Washington D. C.
F. F. Wesbrook, M. D. ..... Minneapolis, Minn.
T. A. Starkey, M. D. ..... Montreal, P. Q.
William T. Sedgwick, M. D. ..... Boston, Mass.
Jesus Gonzales Urena, M. D. ..... Mexico, Mex.
Prof. Edward S. Wood ..... Boston, Mass.

THE SANITATION OF TRAVEL.

GRANVILLE P. CONN, M. D.....Concord, N. H.
BENIAMIN LEE, M. D.....Philadelphia, Pa.
CHARLES P. DUDLEY, M. D.....Altoona, Pa.

THE TENEMENT HOUSE PROBLEM.

THOMAS JORDAN, M. D.....Boston, Mass
W. W. FORD, M. D.....Montreal, P. Q.
CHARLES B. BALL, C. E.....Chicago, Ill.
FREDERICK W. SMITH, M. D.....Syracuse, N. Y.
PAUL E. PREVOST, M. D.....Montreal, P. Q.
LUDWIG HEKTOEN, M D.....Chicago, Ill.

METHODS TO CONTROL THE MILK SUPPLIES OF LARGE CITIES.

WILLIAM H. PARK, M. D.....New York, N. Y.
A. C. ABBOTT, M. D.....Philadelphia, Pa.
HENRY J. BARNES, M. D.....Boston, Mass.
J. A. BEAUDREY, M. D.....Montreal, P. Q.
WALTER W. BRAND, M. D.....Toledo, Ohio.
ARTHUR R. REYNOLDS, M. D.....Chicago, Ill.
WALTER D. GREENE, M. D.....Buffalo, N. Y.

HYGIENE OF DRESS.

FRANK WELLS.....Lansing, Mich.
CHARLES S. CAVERLY, M. D.....Rutland, Vt.
FRANCES DEP. LEAL, M. D.....Mexico, Mex.
ELEANOR PARRY, M. D.....South Hadley, Mass.
HELEN C. PUTNAM, M. D.....Providence, R. I.
EZRA MITCHELL, M. D.....Lancaster, N. H.

SANITARY AGREEMENT BETWEEN ADJOINING NATIONS.

F. MONTIZAMBERT, M D.....Ottawa, Ont.
H. R. CARTER, M. D.....Baltimore, Md.
J. E. MONJARAS, M. D.....Mexico, Mex.
CARLOS J. FINLAY, M. D.....Havana, Cuba.

LABORATORY SECTION.

OFFICERS AND COMMITTEES.

Chairman ..... Dr. V. A. Moore, Ithaca, N. Y.
Vice Chairman ..... Dr. W. H. Park, New York, N. Y.
Secretary ..... Dr. John S. Fulton, Baltimore, Md.
Recorder ..... Dr. H. D. Pease, Albany, N. Y.

COUNCIL.

Dr. H. L. Russell ..... Madison, Wis.
Dr. Charles Harrington ..... Boston, Mass.
Dr. F. F. Wesbrook ..... Minneapolis, Minn.
Dr. John A. Amyot ..... Toronto, Ont.
Dr. Gonzales Fabela ..... Mexico, Mex.

STANDARD METHODS OF WATER ANALYSIS.

G. W. Fuller ..... New York, N. Y.
H. L. Russell ..... Madison, Wis.
R. S. Weston ..... Boston, Mass.
J. W. Ellms ..... Cincinnati, Ohio.
G. C. Whipple ..... New York, N. Y.
H. W. Clark ..... Boston, Mass.
E. O. Jordan ..... Chicago, Ill.

ON DIAGNOSTIC PROCEDURES.

Dr. F. F. Wesbrook ..... Minneapolis, Minn.
Dr. H. W. Hill ..... Boston, Mass.
Dr. F. P. Denny ..... Brookline, Mass.
Dr. F. P. Gorham ..... Providence, R. I.
Dr. Gonzales Fabela ..... Mexico, Mex.

THE SIGNIFICANCE OF BACILLUS COLI IN WATER SUPPLIES.

S. C. Prescott ..... Boston, Mass.
S. De M. Gage ..... Boston, Mass.
B. H. Stone ..... Burlington, Vt.
E. G. Horton ..... Columbus, Ohio.
W. G. Bissell ..... Buffalo, N. Y.

ON BACILLUS TUBERCULOSIS IN MAN AND ANIMALS.

M. P. Ravenel ..... Philadelphia, Pa.
Theobald Smith ..... Boston, Mass.
E. A. de Schweinitz ..... Washington, D. C.
Leonard Pearson ..... Philadelphia, Pa.

ACTION OF FORMALDEHYDE AS A DISINFECTANT.

H. W. HILL.....Boston, Mass.
J. S. FULTON.....Baltimore, Md.
E. G. HORTON.....Columbus, Ohio.
C. A. SNODGRASS.....St. Louis, Mo.
W. H. PARK.....New York, N. Y.

ON ANTITOXIC AND IMMUNIZING SERA.

H. D. PEASE.....Albany, N. Y.
W. H. PARK.....New York, N. Y.
J. J. KINYOUN.....Glenolden, Pa.
THEOBALD SMITH.....Boston, Mass.
JOSEPH MCFARLAND.....Philadelphia, Pa.

THE RELATION OF PROTOZOA TO DISEASE.

CHARLES WARDELL STILES.....Washington, D. C.
JAMES CARROLL.....Washington, D. C.
G. E. BEYER.....New Orleans, La.
L. B. WILSON.....Minneapolis, Minn.

VARIETIES AND ACTION OF ANAEROBIC BACTERIA IN SEWAGE.

J. A. AMYOT.....Toronto, Ont.
C.-E. A. WINSLOW.....Boston, Mass.
L. P. KINNICUTT.....Worcester, Mass.

STANDARD METHODS FOR THE IDENTIFICATION OF BACTERIAL SPECIES.

WILLIAM H. WELCH.....Baltimore, Md.
ARTHUR I. KENDALL.....Baltimore, Md.
HIBBERT W. HILL.....Boston, Mass.

REVISED LIST OF MEMBERS.
AMERICAN PUBLIC HEALTH ASSOCIATION.
1903.

This list includes those who have maintained their membership to the present time, counting those joining in 1903. The Secretary should be notified of any errors or omissions.

MEMBERS.

ABBOTT, SAMUEL W., M. D.	Newton Centre, Mass.	1882
*ABBOTT, ALEX C., M. D.	University of Pennsylvania, Philadelphia, Pa.	1897
ADAMS, CHARLES EVERETT, M. D.	29 W. Broadway, Bangor, Me.	1894
ADAMS, J. F. A., M. D.	Pittsfield, Mass.	1881
ADAMS, J. P.	713 Macheca Bldg.. New Orleans, La.	1902
*ADDY, G. A. B., M. D.	St. John,N. B.	1899
ADGATE, GRACE	515 Lexington Ave., New York, N. Y.	1901
AGNEW, FRANK E., M. D.	Paterson, N. J.	1902
ALEXANDER, EDWARD, M. D.	El Paso, Tex.	1892
ALLEN, THOMAS G., M. D.	439 Elk St., Buffalo, N. Y.	1902
ALVORD, J. W., C. E.,	127 Hartford Building, Chicago, Ill.	1899
AMHERST COLLEGE LIBRARY	Amherst, Mass.	1901
*AMYOT, JNO. A., M. D.	30 St. Joseph St., Toronto, Ont.	1900
ANDERS, H. S., M. D.	1836 Wallace St., Philadelphia, Pa.	1897
*ARCHINARD, JOHN J., M. D.	830 Canal St., New Orleans, La.	1902
ARCHINARD, PAUL EMILE, M. D.	830 Canal St., New Orleans, La.	1902
ARMENT, SAMUEL B., M. D.	Bloomsburg, Pa.	1901
*BADGER, ERNEST F.	48 Wevbosset St., Providence, R. I.	1900
BAGGS, A. N., M. D.	Abington, Pa.	1901
BAILEY, WILLIAM, M. D.	Louisville, Ky.	1879
BAILHACHE, P. H., M. D., P. H. and M. H. S.	Stapleton, N. Y.	1874
BAKER, HENRY B., M D.	Lansing, Mich.	1873
BARBOUR, FRANK A., C. E.	1121 Tremont Bldg., Boston, Mass.	1900
BARNES, HENRY JABEZ, M. D.	429 Beacon St., Boston, Mass.	1896
BARROW, A. FELTUS, M. D.	St. Francisville, La.	1902
BARTLETT, JAMES W.	Dover N. H.	1888
BASHORE, HARVEY B., M. D.	West Fairview, Pa.	1897
BATTLE, SAMUEL W., M. D.,	Asheville, N. C.	1887
BEAUDREY, J. A., M. D.	65 St. Denis St., Montreal, P. Q.	1889
BECKWITH, D. H., M. D.	94 Dorchester Ave., Cleveland, Ohio.	1884
BEEBE, HENRY E., M. D.	Sidney, Ohio.	1882
BELL, A. N., M. D.	337 Clinton St., Brooklyn, N. Y.	1872
BELL, CLARK	39 Broadway, New York, N. Y.	1901
BELL, GORDON, M. D.	Winnipeg, Manitoba.	1899
BENNETT, FRANCIS M., M. D.	137½ State St., Springfield, Mass.	1901

*Also members of Section of Bacteriology and Chemistry.

BERNALDEZ, FRANCISCO, M. D.....Estampa-Merced 5, Mexico, Mex. 1892
BESHOAR, MICHAEL, M. D.....Trinidad, Col. 1895
BESSONETTI, B. J. L., M. D.....St. Espriets, P. Q. 1901
*BEVIER, PROF. ISABEL.....University of Illinois, Urbana, Ill. 1900
BEYER, PROF. GEORGE E.....Tulane University, New Orleans, La. 1902
*BISSELL, WM. G., M.D.....143 Elmwood Ave., Buffalo, N. Y. 1900
BLACKWELL, EMILY, M. D.....53 E. 20th St., New York, N. Y. 1873
BLAND, JOHN J., M. D.....1043 Carondelet St., New Orleans, La. 1902
BOARDMAN, WM. FREARS.....Department of Interior, Ottawa, Ont. 1898
BOARD OF HEALTH.....Manchester, N. H. 1899
*BOLING, GEO. E.....1257 Belmont St., Brockton, Mass. 1900
BRACKEN, H. M., M. D.....514 Pioneer Press Bldg., St. Paul, Minn. 1895
BRACKETT, C. F., M. D.....Princeton, N. J. 1899
BRAND, WALTER W., M. D.....216 Michigan Ave., Toledo, Ohio. 1901
BRAUNNAGEL, JULIUS, M. D.....Box 925, San Antonio, Tex. 1890
BRENA, JUAN, M. D.....Zacatecas, Mex. 1898
BREWER, PROF. WILLIAM H., M. D.....New Haven, Conn. 1874
BROWN, GEORGE, M. D.....Atlanta, Ga. 1902
BROWNFIELD, JAMES H., M. D.....321 Main St., Fairmont, W. Va. 1902
BRYCE, PETER H., M. D.....Department of Interior, Ottawa, Ont. 1883
BUECHNER, W. L., M. D.....34 E. Federal St., Youngstown, Ohio. 1900
BURROUGHS, JAS. A., M. D.....Asheville, N. C. 1898
BUTTERFIELD, F. C.....Derby Line, Vt. 1902
*BUXTON, BERTRAM H., M. D.....1 West 101st St., New York, N. Y. 1901

CABANA, LOUIS V., M. D.....1212 Main St., Fall River, Mass. 1898
*CAIRD, JAMES M.....271 River St., Troy, N. Y. 1900
CAIRNS, R. A., C. E.....Waterbury, Conn. 1901
CAMERON, ALLEN, M. D.....Owen Sound, Ont. 1886
CAMERON J. CHALMERS, M. D.....941 Dorchester St., Montreal, P. Q. 1894
CAMPBELL, EDW. R., M. D.....Bellows Falls, Vt. 1902
CANTRELL, GEO. M. D., M. D.....116 Louisiana St., Little Rock, Ark. 1902
*CAREY, HARRY WARDELL, M. D.....22 Lancaster St., Albany, N. Y. 1902
CARNEGIE LIBRARY.....Pittsburg, Pa. 1902
CARRIEDO, ADELBERTO, M. D.....Oaxaca, Mex. 1901
CARTER, HENRY R., M. D.....U. S. Marine Hospital, Baltimore, Md. 1902
CAVERLY, CHARLES S., M. D.....Rutland, Vt. 1894
CHACON, AUGUSTIN, M. D.....Cocheras No. 21 Mexico, Mex. 1902
CHAILLE, PROF. STANFORD E.....P. O. Drawer 261, New Orleans, La. 1874
CHALARON, FRANK J., M. D.....1318 Esplanade St., New Orleans, La. 1902
CHANDLER, PROF. C. F.....Columbia College, New York, N. Y. 1872
CHANDLER, DAVID D.....74 No. 7th St., Newark, N. J. 1896
CHAPIN, CHARLES V., M. D.....Providence, R. I. 1886
*CHAPIN, JULES, M. D.....496½ Rue Rachel, Montreal. P Q, 1900
CHAPMAN, W. C., M. D.....1708 Madison St., Toledo, Ohio. 1900
CHARLTON, GEORGE A., M. D.....McGill University, Montreal, P. Q. 1901
CHASE, HARMAN L., M. D.....Brookline, Mass. 1895
CHASE, JOHN C., C. E.....Derry, N. H. 1890
CHAUSSE, ALCIDE.....1539 Notre Dame St., Montreal, P. Q. 1901
CHICO, JESUS, M. D..2 Estrella St., Guanajuato City, Guanajuato, Mex. 1891

* Also members of Section of Bacteriology and Chemistry.

CHURCH, THOMAS TEASDALE, M. D.....70 E Main St., Salem, Ohio. 1890
*CLARK, HARRY W.....State House, Boston, Mass. 1896
CLARK, J. FRED, M. D.....Fairfield, Ia. 1899
COFFEY, JAMES C.....Worcester, Mass. 1896
CONN, G. P., M. D.....Concord, N. H. 1875
*CONNELL, WALTER THOMAS, M. D.....Kingston, Ont. 1898
*CONNELLY, R. N., M. D.....Newark, N. J. 1898
CONNER, P. S., M. D.....215 West Ninth St., Cincinnati, Ohio. 1884
COOK, J. T., M. D.....636 Delaware Ave., Buffalo, N. Y. 1901
*COPLIN, WILLIAM L.....1629 So. Broad St., Philadelphia, Pa. 1897
CORBETT, J. F., M. D.....2446 Park Ave., Minneapolis, Minn. 1899
*COSTER, W. H.....Center and Craig Sts., Pittsburg, Pa. 1901
COWING, HUGH A., M. D.....210 High St., Muncie, Ind. 1900
COX, EDGAR, M. D.....13½ W. Mulberry St., Kokomo, Ind. 1900
CRAIG, G. G., M. D.....Rock Island, Ill. 1880
CRANDALL, WM. S.....253 Broadway, New York, N. Y. 1901
CRAVEN, MCDONOUGH, C. E.....263 82d St., Brooklyn, N. Y. 1899
CROES, J. JAMES R., C. E.....68 Broad St., New York, N. Y. 1877
CROSSLAND, JEFFERSON C., M. D.....213 Seventh St., Zanesville, O. 1902
CURTIS FRANCIS GEORGE, M. D.....West Newton, Mass. 1897
CURTIS, F. C., M. D.....17 Washington Ave., Albany, N. Y. 1883

DALRYMPLE, WM. H., V. S.....Baton Rouge, La. 1902
*DAVIS FLOYD, Ph. D.....Des Moines, Iowa. 1890
DAVIS, N. S., M. D.....65 Randolph St., Chicago, Ill. 1887
DEDRICK, ALBERT C., M. D.....247 No. Main St., Fall River, Mass. 1900
DE LANO WM., M. D.....122 Monroe St., Grand Rapids, Mich. 1901
DEL MORAL, MANUEL, M. D.....Iraputo, Mex. 1901
*DENNY, F. P., M. D.....Brookline, Mass. 1901
DENNIS, LABAN, M. D.....30 Central St., Newark, N. J. 1877
DISBROW, WM. S., M. D.....151 Orchard St., Newark, N. J. 1899
DODGE, CHARLES WRIGHT.....University of Rochester, Rochester, N. Y. 1901
DODGE, WILLIAM E., JR.....11 Cliff St., New York, N. Y. 1874
*DORSET, MARION, M. D....Bureau Animal Industry, Washington, D. C. 1900
DOTY, ALVAH H., M. D.....Quarantine, Staten Island, N. Y. 1896
*DROWN, THOMAS M., M. D.....South Bethlehem, Pa. 1887
DUDLEY, CHARLES P., M. D.....Altoona, Pa. 1888
DURGIN, SAMUEL H., M. D.....12 Beacon St., Boston, Mass. 1875
DYER, ISADORE, M. D.....124 Baronne St., New Orleans, La. 1902

EAGLESON, JAMES B., M. D.....512 Burke Building, Seattle, Wash. 1896
EARL, GEORGE GOODELL.....602 Carondelet St., New Orleans, La. 1902
EATON, J. M., M. D.....Carberry, Manitoba. 1901
EGAN, J. A., M. D.....Springfield, Ill. 1897
EGBERT, SENECA, M. D.....17th and Cherry Sts., Philadelphia, Pa. 1901
ELGIN, W. F., M. D.....Glenolden, Pa. 1900
ELIOT, LLEWELLYN, M. D.....1106 P. St. N. W., Washington, D. C. 1902
*ELLMS, J. W.....East Court and Martin Sts., Cincinnati, Ohio. 1897
ELSNER, JOHN, M. D.....P. O. Box 454, Denver, Col. 1887
*EMERSON, H. C., M. D.....11 Maple St., Springfield, Mass. 1899

*Also members of Section of Bacteriology and Chemistry.

*Ernst, Harold C., M .D.....Harvard Medical School, Boston, Mass. 1899
Espinosa, Luis, M. D.....Jalapa, Mex. 1901
Exton, James A., M. D.....75 Beech St., Arlington, N. J. 1897

*Fabelo, Octavino Gonzales, M. D.,
10 Calle de la Violetta, No. 6, Mexico, Mex. 1901
Fagan, C. J, M. D.....Victoria, B. C. 1901
Fales, Frank L., C. E.....City Hall, Cincinnati, Ohio. 1893
Farnham, Edwin, M. D.....Cambridge, Mass. 1889
Farquhar, A. B., Esq.....York, Pa. 1880
Fenton, Thomas, H., M. D..Spruce and Juniper Sts., Philadelphia, Pa. 1897
Ferguson, F., M. D.....20 W. 38th St., New York, N. Y. 1892
Finlay, Carlos Juan, M. D.....128 Reina, Havana, Cuba. 1902
Fisher, E. B., M. D.....Frederictown, N. B. 1901
Flick, Lawrence F., M. D.....736 Pine St., Philadelphia, Pa. 1890
Florence, John H., M. D.....Dallas, Texas. 1899
Fogarty, Joseph Norman, M. D.....227 Duval St., Key West, Fla. 1902
Folkes, Hyman McMackin, M. D.....Howard Ave., Biloxi, Miss. 1902
Foote, Charles Jenkins, M. D.....26 Elm St., New Haven, Conn. 1895
Force, Jno. P., C. E.....Columbus, Ohio. 1900
Formento, Felix, M. D.....New Orleans, La. 1880
*Freeman, R. G., M. D.....478 W. 59th St., New York, N. Y. 1899
Fries, Albert, M. D.....92 Reade St., New York, N. Y. 1897
*Fuller, George W.....170 Broadway, New York, N. Y. 1892
Fulton, John S., M. D.....10 South St., Baltimore, Md. 1897
Furniss, Henry W., M. D.....Bahia, Brazil. 1900

Gable, Isaac C., M. D.....26 South St., York, Pa. 1897
*Gage, Stephen DeM.....Experiment Station, Lawrence, Mass. 1901
Garcia, Eduardo, M. D.....Santiago de Chili, Republic of Chili. 1902
Gavino, A., M. D.....Ratas No. 4, Mexico, Mex. 1891
Gayon, Jose P., M. D.....Mexico City, Mex. 1902
*Gehrmann, Adolph, M. D.....3816 Ellis St., Chicago, Ill. 1895
Gemmill, W. T., M. D.....Forest, Ohio. 1900
Gerhard, Wm. Paul, C. E....33 Union Square West, New York, N. Y. 1880
Gerrish, Frederic H., M. D.....Portland, Me. 1885
*Gilliland, S. H., M. D.....3608 Pine St., Philadelphia, Pa. 1900
Goldwater, S. S., M. D.....Mt. Sinai Hospital, New York, N. Y. 1902
Goler, Geo. W., M. D.....127 East Ave., Rochester, N. Y. 1900
Good, J. Louis.....610 City Hall, Philadelphia, Pa. 1901
Goodridge, E. A., M. D.....63 Jamaica Ave., Flushing, N. Y. 1900
Gorgas, Wm. C., M. D., U. S. A.....Governor's Island, N. Y. 1901
*Gorham, Fred. P.....Brown University, Providence, R. I. 1899
Graves, E. E., M. D.....Penacook, N. H. 1886
Gray, Crosby.....4618 Forbes St., Pittsburg, Pa. 1874
Gray, Samuel M., C. E.....10 Weybosset St., Providence, R. I. 1891
Green, J. Mercier, M. D.....Charleston, S. C. 1902
Greene, Walter D., M. D.....385 Jersey St., Buffalo, N. Y. 1902
Greenleaf, Chas. R., M. D., U. S. A.....San Francisco, Cal. 1901
Griffith, S. H., M. D.....1308 N. H. Ave., Washington, D. C. 1901
Grubbs, Samuel Bates, M. D.....Gulf Quar. Sta., Biloxi, Miss. 1902

*Also members of Section of Bacteriology and Chemistry.

GUITERAS, JUAN, M. D.....119 San Miguel St., Havana, Cuba. 1902
GUTHRIE, JOHN B., M. D.....124 Baronne St., New Orleans, La. 1902
GUZMAN, IGNACIO, M. D.....Toluca, Mex. 1900

HAASE, MARCUS, M. D.....Memphis, Tenn. 1902
HAGEY, JACOB MOYER, M. D.....Mt. Morris, N. Y. 1892
HAIGH, HENRY A., ESQ.....47 Alexandrine Ave., Detroit, Mich. 1901
HAMMER, R. B., M. D.....Greensburg, Pa. 1901
*HARRINGTON, CHARLES, M. D.....Harvard Med. School, Boston, Mass. 1901
*HARRIS, NORMAN McL., M. D.....University of Chicago, Chicago, Ill. 1899
HARRISON, F. C. S., M. D.....Guelph, Ont. 1901
HARRISON, GEORGE WOOD, M. D.....404 Second St., Ashland, Wis. 1896
HARTZELL, JOSIAH, Ph. D.....Canton, Ohio. 1895
HARVARD COLLEGE LIBRARY.....Cambridge, Mass. 1900
HASKELL, W. A., M. D.....Alton, Ill. 1883
HAWKINS, R. G., M. D.....Palmetto, La. 1902
*HAZEN, ALLEN, C. E.....220 Broadway, New York, N. Y. 1892
*HEKTOEN, LUDWIG, M. D.....Rush Medical College, Chicago, Ill. 1899
HENGERER, WILLIAM.....Buffalo, N. Y. 1896
HERING, RUDOLPH, C. E.....170 Broadway, New York, N. Y. 1878
HEROLD, H. C. H., M. D.....Newark, N. J. 1898
HILL, G. EVERETT, C. E.....156 Fifth Ave., New York, N. Y. 1897
*HILL, HIBBERT W., M. D.....Sudbury and Hawkins Sts., Boston, Mass. 1896
HILL, JOHN EDW.....Brown Univ., Providence, R. I. 1902
HILL, JOHN W., C. E.....City Hall, Philadelphia, Pa. 1896
*HISS, PHILIP H., Jr., M. D.....437 W. 59th St., New York, N. Y. 1899
*HODENPYL, EUGENE, M. D.....437 W. 59th St., New York, N. Y. 1901
HOHENSCHUH, W. P.....Iowa City, Ia. 1899
HOLLIS, FREDERICK S.....29 Norton St., New Haven, Conn. 1902
HOLMES, A. MANSFIELD, M. D.....205 Jackson Block, Denver, Col. 1899
HOLTON, HENRY D., M. D.....Brattleboro, Vt. 1875
HOPKINS, HENRY R., M. D.....433 Franklin St., Buffalo, N. Y. 1894
*HORTON, ELMER G., B. S.....Columbus, Ohio. 1897
*HUDDLESTON, J. H., M. D.....126 W. 85th St., New York, N. Y. 1899
HUNT, A. CLARK, M. D.....Metuchen, N. J. 1888
HUNT, C. C., M. D.....Dixon, Ill. 1889
HUNT, WM. T.....204 Market St., Newark, N. J. 1901
HURTADO, FRANCISCO, M. D....1636 a Presidente St., Mexico City, Mex. 1902
HURTY, JOHN N., M. D.....29 E. Second St., Indianapolis, Ind. 1896

IGLESIAS, MANUEL S., M. D.....Veracruz, Mex. 1900
IRONS, ERNEST E.....University of Chicago, Chicago, Ill. 1900

*JACKSON, DANIEL D.,
Flatbush Ave. and Eastern Parkway, Brooklyn, N. Y. 1899
JESSOP, ROLAND, M. D.....204 St. George St., York, Pa. 1901
JOHNSON, CHAS. B., M. D.....Champaign, Ill. 1897
*JOHNSON, GEO. A.....170 Broadway, New York, N. Y. 1900
JONES, C. HAMPSON, M. D.....211 W. Franklin St., Baltimore, Md. 1898
JONES, HAMILTON POLK, M. D.....124 Baronne St., New Orleans, La. 1902
JONES, HEBER, M. D.....Memphis, Tenn. 1902
JONES, LEANDER P., M. D.....Greenwich, Conn. 1889

*Also members of Section of Bacteriology and Chemistry.

*JORDAN, EDWIN O.....University of Chicago, Ill. 1899
JORDAN, THOMAS, M. D.....Board of Health, Boston, Mass. 1902
JUSTICE, WM. W.....Germantown, Philadelphia, Pa. 1901

KARSNER, CHARLES W., M. D.....1320 S. Broad St., Philadelphia, Pa. 1897
KELLOGG, J. H., M. D.....Battle Creek, Mich. 1878
*KENDALL, ARTHUR I.....1020 N. Broadway, Baltimore, Md. 1902
KENDRICK, MINNIE M.....3507 Baring St., Philadelphia, Pa. 1901
KENNEDY, J. F., M. D.....Des Moines, Iowa. 1885
KIEFER, GUY LINCOLN, M. D.....365 St. Aubin Ave., Detroit, Mich. 1902
KING, WILLIAM A.....Census Bureau, Washington, D. C. 1901
*KINNICUTT, LEONARD P., S. D.....Worcester, Mass. 1899
KINYOUN, J. J., M. D.....Glenolden, Pa. 1902
*KNEASS, S. S., M. D.....1510 Walnut St., Philadelphia, Pa. 1899
*KNOWLES, MORRIS, C. E.....Bureau of Filtration, Pittsburg, Pa. 1901
KNOX, S. P. B., M. D.....912 Anacapa, Santa Barbara, Cal. 1892
KNOX, WILLIAM F., M. D.....McKeesport, Pa. 1887
KOBER, GEORGE M., M. D.....1600 T St., Washington, D. C. 1896
KOHN, JOSEPH .....500 Canal St., New Orleans, La. 1902
KOHNKE, QUITMAN, M. D.....1315 St. Andrew St., New Orleans, La. 1902
KUICHLING, EMIL, C. E.....52 Broadway, New York, N. Y. 1882

LABOUISSE, H. R.....830 Common St., New Orleans, La. 1902
LACHAPELLE, E. PERSILLIER, M. D.....Montreal, P. Q. 1887
LANDRETH, OLIN H., C. E.....Schenectady, N. Y. 1900
LEAL, JOHN LAINY, M. D.....149 Ellison St., Paterson, N. J. 1891
LEARNED, JOHN B., M. D.....Northampton, Mass. 1889
LEE, BENJAMIN, M. D.....1420 Chestnut St., Philadelphia, Pa. 1874
LEIGHTON, MARSHALL O.....U. S. G. S., Washington, D. C. 1897
LEITER, L. Z., ESQ.....P. O. Drawer L, Chicago, Ill. 1876
LEMP, WILLIAM T.....St. Louis, Mo. 1884
LEVY, M., M. D.....Macheca Bldg., New Orleans, La. 1902
LEWIS, DANIEL, M. D.....249 Madison Ave., New York, N. Y. 1894
LEWIS, E. S., M. D.....124 Baronne St., New Orleans, La. 1902
LEWIS, RICHARD H., M. D.....Raleigh, N. C. 1892
LICEAGA, EDUARDO, M. D.....4 San Andres St., Mexico, Mex. 1891
LINDSLEY, CHARLES A., M. D.....New Haven, Conn. 1875
LINDSLEY, J. M., M. D.....Havana, Cuba. 1902
LINN, ALEX. M., M. D.....218 Sixth Ave., Des Moines, Iowa. 1902
LOEBER, F., M. D.....1629 Coliseum St., New Orleans, La. 1902
LOPEZ, FERNANDO, M. D.....Mexico City, Mex. 1901
LUMSDEN, W. J., M. D.....Elizabeth City, N. C. 1892
*LYONS, ROBERT E.....630 East Third St., Bloomington, Ind. 1900

MCCLELLAND, J. H., M. D.....Fifth and Wilkins Ave., Pittsburg, Pa. 1885
MCCLUNG, HESTER .....312 N. West St., Indianapolis, Ind. 1900
MCCORMACK, J. N., M. D.....Bowling Green, Ky. 1880
MCCUTCHON, PERCIVAL B., M. D., 203 Carondolet St., New Orleans, La. 1902
*MCDANIEL, O., M. D.....912 Fourth Ave., South., Minneapolis, Minn. 1901
MACDONALD, JNO. A., M. D.....Brandon, Manitoba. 1900
*MCFARLAND, JOSEPH, M. D.....447 Stafford St., Germantown, Pa. 1897

* Also members of Section of Bacteriology and Chemistry.

McGehee, E. L., M. D.....Macheca Bldg., New Orleans, La. 1902
McKlveen, John A., M. D.....Chariton, Iowa. 1899
McLaughlin, Geo. E., M. D.....41 Crescent Ave., Jersey City, N. J. 1901
McNeil, J. Henry, M. D.....33 Sheboygan St., Fond du Lac, Wis. 1896
Magennis, Bryan C., M. D.....Bridge St., Paterson, N. J. 1900
Maignen, P. A.....1310 Arch St., Philadelphia, Pa. 1902
Marchand, Charles .....57 Prince St., New York, N. Y. 1900
Marks, Solon, M. D.....Milwaukee, Wis. 1876
Marquez, Migul, M. D.....Oficiana Calle 49, Chihuahua, Mex. 1896
Marsh, E. J., M. D.....600 Park Ave., Paterson, N. J 1872
Marshall, Charles E.....Agricultural College, Mich. 1901
Massachusetts Institute Technology.....Boston, Mass. 1901
*Matson, E. G., M. D.....6th Ave. and Cherry Alley, Pittsburg, Pa. 1900
Matthews, W. E., M. D.....425 Lincoln St., Johnstown, Pa. 1897
May, George S.....74 Rideau St., Ottawa, Ont. 1902
May, Wm. B., M. D.....251 Jefferson St., Buffalo, N. Y. 1901
Mayer, Fred. J., M. D.....Scott, La. 1902
Mead, Daniel Webster, C. E....1st National Bank Bldg., Chicago, Ill. 1892
Mead, Julian Augustus, M. D.....Irving St., Watertown, Mass. 1896
Meehan, J. H., M. D.....432 Third St., Niagara Falls, N. Y. 1901
*Metz, Abraham L., M. D., Medical Dept. Tulane Univ., New Orleans, La. 1902
Miller, Wm. T., M. D.....260 Euclid Ave., Cleveland, Ohio. 1902
Mitchell, Henry, M. D.....Asbury Park, N. J. 1886
Mohr, Charles, M. D.....Oak Lane, Philadelphia, Pa. 1897
*Monjaras, Jesus E., M. D.,.....2 a de Yturbide No. 1, Mexico, D. F. 1891
Monjeau, C., C. E.....Middletown, Ohio. 1887
Montgomery, L. H., M. D.....92 State St., Chicago, Ill. 1879
Montizambert, Frederick, M. D.....Ottawa, Ont. 1885
Moore, Eduardo, M. D.....Santiago de Chili, Republic of Chili. 1902
*Moore, Veranus A., M. D.....Veterinary College, Ithaca, N. Y. 1896
Morgan, David Percy.....Box 2036, New York, N. Y. 1885
Morris, Moreau, M. D.....109 E. 73d St., New York, N. Y. 1896
Morse, W. F., S. E.....287 Fourth St., New York, N. Y. 1889
Mosher, Eliza M., M. D.....44 Court St., Brooklyn, N. Y. 1889
Mulford, Henry K.....412 So. 13th St., Philadelphia, Pa. 1896
Munson, E. L., M. D.....Surgeon General's Office, Washington, D. C. 1901

Nagle, John T., M. D.....163 West 126th St., New York, N. Y. 1874
Neff, J. L., M. D.....Mutual Life Bldg., Philadelphia, Pa. 1897
Newbury Library .....Chicago, Ill. 1901
Newell, F. H.....U. S. Geological Survey, Washington, D. C. 1897
Newman, G. A., M. D.....New London, Minn. 1899
New York Public Library.....40 Lafayette Place, New York, N. Y. 1898
Nolte, Arthur, M. D.....1505 State St., New Orleans, La. 1901
*Noriega, Pedro, M. D.....Monterey, Mex. 1901
Nunn, R. J., M. D.....5 York St. East, Savannah, Ga. 1881
*Nuttal, George H. F., M. D
3 Cranmer St., Pathological Laby, New Museum, Cambridge, Eng. 1891

Ohage, Justus, M. D.....7th and Waconta Sts., St. Paul, Minn. 1899
Oliphant, Samuel R., M. D.....147 Baronne St., New Orleans, La. 1902

* Also members of Section of Bacteriology and Chemistry.

OLOGUI, AUGUSTIN RUIZ, M. D.....San Juan del Rio Qro, Mex. 1901
OTIS, EDWARD OSGOOD, M. D.....381 Beacon St., Boston, Mass. 1894
OTTO, JACOB S., M. D.....394 Franklin St., Buffalo, N. Y. 1900
OWEN, JAMES, C. E.....Montclair, N. J. 1901

PARHAM, F. W., M. D.....609 Macheca Bldg., New Orleans, La. 1902
*PARK, WM. H., M. D.....315 W. 76th St., New York, N. Y. 1899
*PARKER, HORATIO N.....Montclair, N. J. 1900
PARMALEE, CHAS. L.....136 Liberty St., New York, N. Y. 1899
PARRY, ELEANOR, M. D.....Mt. Holyoke College, South Hadley, Mass. 1901
PATTON, GEORGE F., M. D.....1134 Camp St., New Orleans, La. 1902
PEARSON, LEONARD, V. M. D.....3608 Pine St., Philadelphia, Pa. 1897
*PEASE, HERBERT D., M. D.....116 Washington Ave., Albany, N. Y. 1897
PECK, GEORGE, M. D., U. S. N.....926 No. Broad St., Elizabeth, N. J. 1890
PELLETIER, ELZEAR, M. D.....76 St. Gabriel St., Montreal, P. Q. 1902
PELLETIER, P., M. D.....79 Bowen Ave., Sherbrooke, P. Q. 1902
PENNSYLVANIA R. R. RELIEF DEPT.....Philadelphia, Pa. 1899
*PERKINS, ROGER G., M. D.....1527 Euclid Ave., Cleveland, Ohio. 1902
*PHELPS, EARLE B.....Mass. Inst. Tech., Boston, Mass. 1902
PIERCE, CLAUDE C., M. D.....P. H. and M. H. S., Mullett Key, Fla. 1902
PIERCE, IMOGENE S.....Manassass, Va. 1901
PINA, MANUEL GARCIA, M. D.....Cordoba, Mex. 1902
POHL, GUSTAV, M. D.....96 Lemon St., Buffalo, N. Y. 1901
*PORTER, JOHN LEWIS.....604 Carondelet St., ew Orleans, La. 1902
PORTER, JOSEPH Y., M. D.....Jacksonville, Fla. 1878
POTHIER, O. J., M. D.....124 Baronne St., New Orleans, La. 1902
POWELL, D. T., M. D.....Thayer, Mo. 1902
POWERS, F. W., M. D.....Reinbeck, Iowa. 1901
PRADO, RAMON N., M. D.....Mexico City, Mex. 1902
PRESCOTT, SAMUEL C.....Mass. Institute Technology, Boston, Mass 1902
PRESTON, C. H., M. D.....1322 Fulton Ave., Davenport, Iowa. 1900
PROBST, C. O., M. D.....Columbus, Ohio. 1886
*PRUDDEN, T. MITCHELL, M. D.....160 W. 59th St., New York, N. Y. 1899
PUTNAM, HELEN C., M. D.....121 Angell St., Providence, R. I. 1901

RAMIREZ, JOSE, M. D.....Mexico City, Mex. 1902
*RAVENEL, M. P., M. D.....University of Pennsylvania, Philadelphia, Pa. 1897
RAYMOND, JOSEPH H., M. D.....145 Willow St., Brooklyn, N. Y. 1882
RENNER, WM. SCOTT, M. D.....316 Pearl St., Buffalo, N. Y. 1901
REPP, JOHN J., V. M. D.....Ames, Iowa. 1899
REYNOLDS, A. R., M. D.....City Hall, Chicago, Ill. 1893
REYNOLDS, M. H., V. M. D.....St. Anthony Park, Minn. 1899
RICE, A. J., M. D.....707 Main St., San Francisco, Cal. 1902
RICHARD, CHARLES, M. D.....Manila, P. I. 1900
RICHARDS, EDGAR.....341 West 88th St., New York, N. Y. 1889
RICHARDS, MRS. E. H.....Institute of Technology, Boston, Mass. 1888
RICHARDSON, MAJ. HENRY B., C. E.....New Orleans, La. 1880
RICHARDSON, W. L., M. D.....225 Commonwealth Ave., Boston, Mass. 1875
RICKARDS, BURT RANSOM, S. B.....607 Sudbury Bldg., Boston, Mass. 1901
RILEY, JNO. A., M. D.....1677 Greenshaw St., Chicago, Ill. 1901
RIVES, WILLIAM C., M. D.....1723 I St., Washington, D. C. 1885

*Also members of Section of Bacteriology and Chemistry.

ROBERTS, CHARLES F., M. D.....250 W. 57th St., New York, N. Y. 1892
*ROBIN, ALBERT, M. D.....817 Adams St., Wilmington, Del. 1899
*ROBINSON, PROF. FRANKLIN C.....Brunswick, Me. 1889
ROBINSON, JOHN FRANKLIN, M. D.....Manchester, N. H. 1894
*ROSENAU, M. J., M. D.....P. H. and M. H. S., Washington, D. C. 1901
ROSS, JOHN WALTON, M. D....U. S. Naval Museum, Washington, D. C. 1902
RUIZ, LUIS E., M. D.....c Roma 2049, Mexico, Mex. 1902
RUSSELL, H. L.....Madison, Wis. 1899
RUSSELL, JULIA WALLACE-, M. D.....44 Pleasant St., Concord, N. H. 1892
RUTHERFORD, J. G., M. D.....Ottawa, Ont. 1902

SALMON, D. E., D. V. M....Bureau Animal Industry, Washington, D. C. 1883
SALMON, LUCIEN F., M. D.....2013 Prytania St., New Orleans, La. 1902
SAMOSTZ, OSCAR.....426 So. 13th St., Philadelphia, Pa. 1902
SCHAFFNER, FRED. LAWRENCE, M. D.....Boissevain, Manitoba. 1902
SCHOONOVER, WARREN, M. D.....115 East 59th St., New York, N. Y. 1895
SCOTT, JOSEPH J., M. D.....1808 Prytania St., New Orleans, La. 1902
SCOTT, WALTER A., M. D.....610 Pine St., Niagara Falls, N. Y. 1901
SEAMAN, LOUIS L., M. D.....247 Fifth Ave., New York, N. Y. 1901
SEDGWICK, PROF. W. T.....491 Boyleston St., Boston, Mass. 1902
SHEA, THOMAS B., M. D.....132 Warren St., Boston, Mass. 1900
SHEPARD, CHARLES H., M. D.....Columbia Heights, Brooklyn, N. Y. 1892
SHIRREFFS, REUBEN, C. E.....Westmoreland Club, Richmond, Va. 1902
SHRADER, JOHN C., M. D.....Iowa City, Iowa. 1890
SHULTZ, F. W., M. D.....663 16th St., Milwaukee, Wis. 1901
SIMON, F., M. D.....336 Spring St., Buffalo, N. Y. 1901
*SMART, CHARLES, M. D., U. S. A.....Washington, D. C. 1882
SMART, J. H., M. D.....Dallas, Tex. 1902
SMERSH, F. M., M. D.....Owatonna, Minn. 1899
*SMITH, ERASTUS G., Ph. D.....Beloit, Wis. 1901
SMITH, FREDERICK W., M. D.....700 S. West St., Syracuse, N. Y. 1896
*SMITH, HERBERT E., M. D....Med. Dept. Yale Univ., New Haven, Conn. 1899
SMITH, JOSEPH ROME, M. D.....2300 Delancey St., Philadelphia, Pa. 1902
SMITH, STEPHEN, M. D.....640 Madison Ave., New York, N. Y. 1872
*SMITH, THEOBALD, M. D.....Forest Hills, Boston, Mass. 1899
SMITH, T. GUILFORD.....9 German Ins. Bldg., Buffalo, N. Y. 1896
SMITH, WM. F., M. D.....San Juan, Porto Rico. 1901
SMOCK, PROF. JOHN C.....Trenton, N. J. 1899
SNODGRAS, C. A.....City Hospital, St. Louis, Mo. 1902
SOPER, GEO. A., Ph. D.....29 Broadway, New York, N. Y. 1900
SOUCHON, EDMOND, M. D.....204 Carondelet St., New Orleans, La. 1902
SPAULDING, HERMAN, M. D.....City Hall, Chicago, Ill. 1900
STANDLEE, ELI L., M. D.....2201 University Pl., St. Louis, Mo. 1895
STANTON, BYRON, M. D.....931 Dayton St., Cincinnati, Ohio. 1889
STARK, A. N., M. D., U. S. A.....West Point, N. Y. 1902
STARKEY, T. A., M. D.....McGill Univ., Montreal, P. Q. 1902
*STEBBINS, JAMES H., Ph. D.....80 Madison Ave., New York, N. Y. 1900
*STENGEL, ALFRED, M. D.....Pepper Laboratory, Philadelphia, Pa. 1899
*STERNBERG, GEO. M., M. D.,U. S. A., 2144 California Ave., Washington,D.C. 1874
*STOKES, WM. R., M. D.....Baltimore, Md. 1899
*STONE, BINGHAM H., M. D.....Burlington, Vt. 1900

*Also members of Section of Bacteriology and Chemistry.

STOUGHTON, GRACE A. VAN EVEREN.....Central Valley, N. Y. 1902
STUART, T. A.....State Department of Health, Albany, N. Y. 1902
SUITER, A. WALTER, M. D.....Herkimer, N. Y. 1894
SUITER, F. C., M. D.....La Crosse, Wisc. 1899
SUTHERLAND, QUINCY ORLIN, M. D....73 Milwaukee St., Janesville, Wis. 1895
*SWARTS, GARDNER TABER, M. D.....Providence, R. I. 1894
SYRACUSE UNIVERSITY .....Syracuse, N. Y. 1899

TALBOT, MARION.....University of Chicago, Chicago, Ill. 1893
*TEICHMANN, WM. C.....1141 Market St., St. Louis, Mo. 1901
THAU, A. BLAIR, M. D.....Santa Barbara, Cal. 1901
TOWNE, S. R., M. D.....Omaha, Neb. 1895
TOWNSEND, JOSEPH H., M. D.....39 College St., New Haven, Conn. 1901
TRENNER, SIMEON.....Norristown, Pa. 1901
TUELL, JAS. S., M. D.....222 Water St., Augusta, Me. 1901
TURNBULL, THOMAS, M. D.....314 Western Ave., Allegheny, Pa. 1897

UNDERWOOD, WM. LYMAN.....Belmont, Mass. 1902
URENA, JESUS GONZALES, M. D.....Mexico City, Mex. 1902
URRUTIA, J. JOAQUIN, M. D.....14 Lafragua St., Puebla, Mex. 1902
UTLEY, EDWARD R., M. D.....Newton, Mass. 1898

VALENTINE, FRED. C., M. D.....31 W. 6th St., New York, N. Y. 1896

WADE, JOHN W., M. D.....318 No. 2d St., Millville, N. J. 1897
WALCOTT, HENRY P., M. D.....Cambridge, Mass. 1880
WARNER, FRANK, M. D.....Columbus, Ohio. 1899
*WASDIN, EUGENE, M. D.....U. S. M. Hospital, Buffalo, N. Y. 1901
WATSON, IRVING A., M. D.....Concord, N. H. 1881
WENDE, ERNEST, M. D.....296 Water St., Buffalo, N. Y. 1894
WENDE, JNO., M. D.....1593 Main St., Buffalo, N. Y. 1901
WERTENBAKER, CHARLES P., M. D.,
U. S. Marine Hospital, New Orleans, La. 1902
*WESBROOK, FRANK F., M. D.....Minneapolis, Minn. 1897
*WESTON, ROBERT SPURR .....14 Beacon St., Boston, Mass. 1896
*WHIPPLE, GEO. C.....220 Broadway, New York, N. Y. 1899
WHITE, ALFRED T., M. D.....Box 619, New York, N. Y. 1899
WHITE, WILLIAM A., M. D.....Box 619, New York, N. Y. 1888
WHITNEY, ELI .....New Haven, Conn. 1900
WILBUR, CRESSY L., M. D.....Lansing, Mich. 1894
*WILEY, H. W.....1314 10th St. N. W., Washington, D. C. 1901
WILLIAMS, HERBERT U., M. D.....24 High St., Buffalo, N. Y. 1901
WILLIAMS, TOM A., M. D.....Rice Hotel, Houston, Tex. 1902
WILKINSON, C. P., M. D.....1402 Peters Ave., New Orleans, La. 1889
WILLCOX, W. F.....Cornell University, Ithaca, N. Y. 1899
*WILSON, EZRA H., M. D.....Hoagland Laboratory, Brooklyn, N. Y. 1897
*WILSON, ROBERT, Jr., M. D.....165 Rutledge Ave., Charleston, S. C. 1901
WILTSE, M. J., M. D.....Burlington, Vt. 1901
WINGATE, U. O. B., M. D.....204 Biddle St., Milwaukee, Wis. 1890
WINSLOW, C.-E. A..... Hotel Oxford, Boston, Mass. 1902
WISHARD, WILLIAM N., M. D.....Indianapolis, Ind. 1901
WOOD, ALFRED VINCENT.....1777 Gloucester St., Brunswick, Ga. 1892

*Also members of Section of Bacteriology and Chemistry.

Wood, Mrs. C. P.	108 Powell Ave., Evansville, Ind.	1900
Wood, Prof. Edward S.	Harvard Medical School, Boston, Mass.	1895
Woodbridge, S. Homer	3 Hamilton Pl., Boston, Mass.	1895
Woodcock, G. M., M. D.	Bangor, Me.	1893
Woodhull, Col. A. A., M. D., U. S. A.	Princeton, N. J.	1874
Woodward, William C., M. D.	Washington, D. C.	1896
Worcester Free Library	Worcester, Mass.	1897
Wright, Frank W., M. D.	48 Pearl St., New Haven Conn.	1889
Wright, John W., M. D.	Erie, Pa.	1897
Wroth, James H., M. D.	Albuquerque, N. M.	1902
Wyman, Walter, M. D.	P. H. and M. H. S., Washington, D. C.	1884
Young, A. G., M. D.	Augusta, Me.	1885
Youngerman, Charles, M. D.	Williamsport, Pa.	1901

HONORARY MEMBERS.

Ex-President Grover Cleveland	Princeton, N. J.	1885
J. B. Russell, M. D., LL. D.	Glasgow, Scotland.	1886
Mrs. Elizabeth Thompson	New York, N. Y.	1887
President Porfirio Diaz	Mexico, Mex.	1892

LIFE MEMBER.

Henry Lomb	Rochester, N. Y.	1884

MEMBERS ELECTED AT WASHINGTON MEETING, 1903.

ANDERSON, JOHN F., M. D....U. S. P. H. and M. H. S., Washington, D. C.

BALL, CHARLES B., C. E.....Room 113, City Hall, Chicago, Ill.
BESHOAR, BENJAMIN B., M. D.....Trinidad, Col.
BOND, H. WHEELER, M. D.....17 Vanderwenter St., St. Louis, Mo.
BRUSH, EDWARD F., M. D.....Mt. Vernon, N. Y.

CAMPBELL, ALEXANDER MCKENZIE, M. D.....Grand Rapids, Mich.
CARROLL, JAMES, M. D.....Washington, D. C.
CHAMOT, E. M.....Cornell University, Ithaca, N. Y.
CRANE, WILLIAM HENRY, M. D.....20 West Ninth St., Cincinnati, Ohio.

DAVIS, CLARK W., M. D.....902 Elm St., Cincinnati, Ohio.
DONALDSON, WELLINGTON .....Knoxville, Tenn.
DOUGLAS, ALEXANDER JOSEPH, M. D.....Winnipeg, Manitoba.
DUBOSE, W. R., M. D., U. S. Navy.....Washington, D. C.

EMBICH, MILTON A.....Boiling Springs, Pa.
EVANS, JOSEPH S., Jr., M. D.....Univ. of Pa., Philadelphia, Pa.

FISHER, PROF. IRVING.....New Haven, Conn.
FORWOOD, WILLIAM H., M. D.....1425 Euclid Place, Washington, D. C.
FRANCIS, CHARLES, C. E.....Scott, Iowa.

HERSHEY, MILTON H.....Montreal, Que.

JOHNSON, H. L. E., M. D.....1821 Jefferson Place, Washington, D. C.

KINNEY, ALFRED, M. D.....Astoria, Ore.
KOON, THOMAS M., M. D.....Grand Rapids, Mich.

LEAL, FRANCES DE P., M. D..... 6 2d San Lorenzo, Mexico, Mex.
LUDLOW, JACOB LOTT, C. E.....Winston-Salem, N. C.

MOAT, CHARLES P.....Burlington, Vt.

PERRY, J. C., M. D.....U. S. P. H. and M. H. S., Washington, D. C.
POWELL, THOMAS, M. D.....217 Laughlin Block, Los Angeles, Cal.
PRICE, MARSHALL LANGTON, M. D.....10 South St., Baltimore, Md.

REYBURN, ROBERT, M. D.....2129 F St., Washington, D. C.
RIXEY, P. M., M. D., U. S. Navy.....Washington, D. C.
RUSSELL, JAMES PERCY, M. D.....Augusta, Me.

SALMON, THOMAS W., M. D..U. S. P. H. and M. H. S., Washington, D. C.
SHUTE, GEORGE PERCIVAL, S. E...2023 Park Row Bldg., New York, N. Y.
SOTO, ALBERTO GARDUNO, M. D.....Juarez 14, Toluca, Mex.
STRAUSS, NATHAN.....Broadway and 34th St., New York, N. Y.
SPENCER, LEONARD E., M. D.....Wausau, Wis.
SYLVESTER, IRA W., C. E.....Alexandria, La.

THOMAS, JOHN NEWTON, M. D.....Quarantine, La.
TRONCOSO, MANUEL URIBE, M. D.....Tacuba 14, Mexico, Mex.
TUCKER, WILLIAM C., S. E.....156 Fifth Ave., New York, N. Y.

VALDEZ, ULISES, M. D.....San Juan de Dios 267, Mexico, Mex.

WALES, GEORGE R .....Bellows Falls, Vt.
WELLS, FRANK .....Lansing, Mich.

LIST OF MEMBERS OF THE AMERICAN PUBLIC HEALTH ASSOCIATION BY GEOGRAPHICAL DISTRIBUTION.

CANADA.

BRITISH COLUMBIA.

Victoria: C. J. Fagan, M. D.

MANITOBA.

Boissevain: Fred L. Schaffner, M. D.
Brandon: John A. Macdonald, M. D
Carberry: J. M. Eaton, M. D.
Winnipeg: *Gordon Bell, M. D.; Alexander W. Douglas, M. D.

NEW BRUNSWICK.

Fredericton: E. B. Fisher, M. D
St. Johns: *G. A. B. Addy, M. D.

ONTARIO.

Guelph: *F. C. S. Harrison, M. D.
Kingston: *W. T. Connell, M. D.
Owen Sound: Allen Cameron, M. D.
Ottawa: William Frears Boardman; Peter H. Bryce, M. D.; George S. May; F. Montizambert, M. D.; J. G. Rutherford, M. D.
Toronto: *John A. Amyot, M. D.

QUEBEC.

Montreal: J. A. Beaudrey, M. D.,; J. Chalmers Cameron, M. D.; *Jules A. Chapin, M. D.; Alcide Chausse; George A. Charlton, M. D.; Milton H. Hershey; E. P. Lachapelle, M. D.; Elzear Pelletier, M. D.; T. A. Starkey, M. D.
Sherbrooke: P. Pelletier, M. D.
St. Espriet: B. J. L. Bessonetti, M. D.

CUBA.

Havana: Carlos J. Finlay, M. D.; Juan Guiteras, M. D.; J. M. Lindsley, M. D.

GREAT BRITAIN.

ENGLAND.

Cambridge: *George H. F. Nuttall, M. D.

SCOTLAND.

Cambridge: J. B. Russell, M. D. (Honorary).

*Also members of Section of Bacteriology and Chemistry.

MEXICO.

Chihuahua: Miguel Marquez, M. D.
Cordoba: Manuel G. Pina, M. D.
Guanajuato: Jésus Chico, M. D.
Irapuato: Manuel del Moral, M. D.
Jalapa: Luis Espinosa, M. D.
Mexico: Francisco Bernaldez, M. D.; Hon. Porfirio Diaz (honorary); *Octavino G. Fabela, M. D.; Angel Gaviño, M. D.; Francisco Hurtado, M. D.; Frances de P. Leal, M. D.; Eduardo Licéaga, M. D.; Fernando Lopez, M. D.; Augustin Chacon, M. D.; José P. Gayon, M. D.; Jésus E. Monjarás, M. D.; Ramon N. Prado, M. D.; José Ramirez, M. D.; Manuel Uribe Troncoso, M. D.; Jésus G. Ureña, M. D.; Luis E. Ruiz, M. D.; Ulises Valdes, M. D.
Monterey: Pedro Noriega, M. D.
Oaxaca: Adelberto Carriedo, M. D.
Puebla: Joaquin Urrutia, M. D.
San Juan Del Rio Qro: Augustin Ruiz Olgui, M. D.
Toluca: Ignacio Guzman, M. D.; Alberto Garduño Soto, M. D.
Veracruz: Manuel Iglesias, M. D.
Zacatecas: Juan Breña, M. D.

SOUTH AMERICA.

BRAZIL.

Bahia: Henry W. Furniss, M. D.

CHILI.

Santiago de Chili: Eduardo Garcia, M. D., Eduardo Moore, M. D.

UNITED STATES.

ARKANSAS.

Little Rock: Geo. M. D. Cantrell, M. D.

CALIFORNIA.

Los Angeles: Thomas Powell, M. D.
San Francisco: Charles R. Greenleaf, M. D.; A. J. Rice, M. D.
Santa Barba: S. P. B. Knox, M. D.; A. Blair Thau, M. D.

COLORADO.

Denver: John M. Elsner, M. D.; A. Mansfield Holmes, M. D.
Trinidad: Michael Beshoar, M. D.; Benjamin B. Beshoar, M. D.

CONNECTICUT.

Greenwich: Leander P. Jones, M. D.
New Haven: William H. Brewer, M. D.; Prof. Irving Fisher; Charles J. Foote, M. D.; Frederick S. Hollis; Charles A. Lindsley, M. D.; *Herbert E. Smith, M. D.; Joseph H. Townsend, M. D.; Eli Whitney; Frank W. Wright, M. D.
Waterbury: R. A. Cairns, C. E.

*Also members of Section of Bacteriology and Chemistry.

DELAWARE.

Newark: *Albert Robin, M. D.

DISTRICT OF COLUMBIA.

Washington: John F. Anderson, M. D.; James Carroll, M. D.; *Marion Dorset M. D.; W. R. Dubose, M. D.; Llewellyn Eliot, M. D.; Wm. H. Forwood, M. D.; S. H. Griffith, M. D.; William A. King; George M. Kober, M. D.; H. L. E. Johnson, M. D.; Marshall O. Leighton; E. L. Munson, M. D.; F. H. Newell; J. C. Perry, M. D.; Robert Reyburn, M. D.; P. M. Rixey, M. D.; William C. Rives, M. D.; *Milton J. Rosenau, M. D.; John W. Ross, M. D.; D. E. Salmon, D. V. M.; Thomas W. Salmon, M. D.. *Charles Smart, M. D.; George M. Sternberg, M. D.; *H. W. Wiley; William C. Woodward, M. D.; Walter Wyman, M. D.

FLORIDA.

Jacksonville: Joseph Y. Porter, M. D.
Mullet Key: Claude C. Pierce, M. D.
Key West: Joseph Norman Fogarty, M. D.

GEORGIA.

Atlanta: George Brown, M. D.
Brunswick: Alfred Vincent Wood.
Savannah: R. J. Nunn, M. D.

ILLINOIS.

Alton: W. A. Haskell, M. D.
Champaign: C. B. Johnson, M. D.
Chicago: John W. Alvord, C. E.; Charles B. Ball, C. E.; N. S. Davis, M. D.; *Adolph Gehrmann, M. D.; Norman McL. Harris, M. D.; *Ludvig Hektoen, M. D.; Ernest E. Irons; *E. O. Jordan; L. Z. Leiter; Daniel Webster Mead, C. E.; Liston H. Montgomery, M. D.; A. R. Reynolds, M. D.; John A. Riley, M. D.; Herman Spaulding, M. D.; Marion Talbot.
Dixon: C. C. Hunt, M. D.
Rock Island: G. G. Craig, M. D.
Springfield: J. A. Egan, M. D.
Urbana: *Isabel Bevier.

INDIANA.

Bloomington: *Robert E. Lyons.
Evansville: Mrs. C. P. Wood.
Indianapolis: John N. Hurty, M. D.; Hester McClung; William N. Wishard, M. D.
Kokomo: Edgar Cox, M. D.
Muncie: Hugh A. Cowing, M. D.

IOWA.

Ames: John J. Repp, V. M. D.
Chariton: John A. McElveen, M. D.
Davenport: C. H. Preston, M. D.

* Also members of Section of Bacteriology and Chemistry.

Des Moines: *Floyd Davis, Ph. D.; J. F. Kennedy, M. D.. Alex. M. Linn, M. D.
Fairfield: J. Fred Clark, M. D.
Iowa City: W. P. Hohenschuh; John C. Shrader, M. D.
Reinbeck: F. W. Powers, M. D.
Scott: Charles Francis, C. E.

KENTUCKY.

Bowling Green: J. N. McCormack, M. D.
Louisville: William Bailey, M. D.

LOUISIANA.

Alexandria: Ira W. Sylvester, C. E.
Baton Rouge: Wm. H. Dalrymple, V. S.
Palmetto: R. G. Hawkins, M. D.
Quarantine: John Newton Thomas, M. D.
Scott: Fred J. Mayer, M. D.
St. Francisville: A. Feltus Barrow, M. D.
New Orleans: J. P. Adams; *Jno. J. Archinard, M. D.; Paul E. Archinard, M. D.; Prof. George E. Beyer; John J. Bland, M. D.; Frank J. Chalaron, M. D.; Stanford E. Chaillé, M. D.; F. Formento, M. D.; Isadore Dyer, M. D.; George Goodell Earl; John B. Guthrie, M. D.; Hamilton P. Jones, M. D.; Joseph Kohn; Quitman Kohnke, M. D.; H. R. Labouisse; M. Levy, M. D.; E. S. Lewis, M. D.; F. Loeber, M. D.; P. B. McCutcheon, M. D.; E. L. McGehee, M. D.; *Abraham L. Metz, M. D.; Arthur Nolte, M. D.; Samuel R. Olliphant, M. D.; F. W. Parham, M. D.; George F. Patton, M. D.; *John Lewis Porter; O. J. Pothier, M. D.; Major Henry B. Richardson, C. E.; Joseph T. Scott, M. D.; Edmond Souchon, M. D.; Lucien F. Salomon, M. D.; Chas. P. Wertenbaker, M. D.; C. P. Wilkinson, M. D.

MAINE.

Augusta: James Percy Russell, M. D.; James S. Tuell, M. D.; A. G. Young, M. D.
Bangor: Charles Everett Adams, M. D.; G. M. Woodcock, M. D.
Brunswick: *Franklin C. Robinson.
Portland: Frederic H. Gerrish, M. D.

MARYLAND.

Baltimore: Henry R. Carter, M. D.; John S. Fulton, M. D.; C. Hampson Jones, M. D.; *Arthur I. Kendall; Marshall Langton Price, M. D.; *William Royal Stokes, M. D.

MASSACHUSETTS.

Belmont: William L. Underwood.
Boston: Frank A. Barbour, C. E.; Henry J. Barnes, M. D.; *Harry W. Clark; Samuel H. Durgin, M. D.; *Harold C. Ernest, M. D.; *Charles Harrington, M. D.; *Hibbert W. Hill, M. D.; Thomas Jordan; *Earle B. Phelps; Samuel C. Prescott; Edward O. Otis, M. D.; *Mrs. E. H. Richards; W. L. Richardson, M. D.; *Burt Ransom Rickards, S. B.; William T. Sedgwick; Thomas B. Shea, M. D.; *Theobald Smith, M. D.; *Robert Spurr

*Also members of Section of Bacteriology and Chemistry.

Weston; C.-E. A. Winslow, Edward S. Wood, S. H. Woodbridge.
Brockton: *George E. Bolling.
Brookline: Herman L. Chase, M. D.; *Francis P. Denny, M. D.
Cambridge: Edwin Farnham, M. D.; Henry P. Walcott, M. D.
Fall River: Louis V. Cabana, M. D.; Albert C. Dedrick, M. D.
Lawrence: *Stephen DeM. Gage.
Newton: Edward R. Utley, M. D.
Newton Centre: S. W. Abbott, M. D.
Northampton: John B. Learned, M. D.
Pittsfield: J. F. A. Adams, M. D.
South Hadley: Eleanor Parry, M. D.
Springfield: Francis M. Bennitt, M. D.; *H. C. Emerson, M. D.
Watertown: Julian Augustus Mead, M. D.
West Newton: Francis George Curtis, M. D.
Worcester: James C. Coffey; *L. P. Kinnicutt; Charles E. Marshall.

MICHIGAN.

Battle Creek: J. H. Kellogg, M. D.
Detroit: Henry A. Haigh, Esq.; Guy Lincoln Kiefer, M. D.
Grand Rapids: Alexander M. Campbell, M. D.; William Delano, M. D.; Thomas M. Koon, M. D.
Lansing: Henry B. Baker, M. D.; Frank Wells; Cressy L. Wilbur, M. D.

MINNESOTA.

Minneapolis: *J. F. Corbett, M. D.; *O. McDaniel, M. D.; *F. F. Wesbrook, M. D.
New London: G. A. Newman, M. D.
Owatonna: F. M. Smersh, M. D.
St. Anthony's Park: M. D. Reynolds, V. M. D.
St. Paul: Henry M. Bracken, M. D.; Justus Ohage, M. D.

MISSISSIPPI.

Biloxi: Hyman McM. Folkes, M. D.; Samuel B. Grubbs, M. D.

MISSOURI.

St. Louis: H. Wheeler Bond, M. D.; William T. Lemp; C. A. Snodgras; Eli L. Standlee, M. D.; *William C. Teichmann.
Thayer: D. T. Powell, M. D.

NEW HAMPSHIRE.

Concord: G. P. Conn, M. D.; Julia Wallace-Russell, M. D.; Irving A. Watson, M. D.
Derry: John C. Chase, C. E.
Dover: James W. Bartlett.
Manchester: John Franklin Robinson, M. D.
Penacook: E. E. Graves, M. D.

*Also members of Section of Bacteriology and Chemistry.

NEW JERSEY.

Arlington: James A. Exton, M. D.
Asbury Park: Henry Mitchell, M. D.
Elisabeth: George Peck, M. D.
Jersey City: *George E. McLaughlin, M. D.
Metuchen: A. Clark Hunt, M. D.
Millville: John W. Wade, M. D.
Montclair: James Owen, C. E.; Horatio N. Parker.
Newark: D. D. Chandler; *R. N. Connelly, M. D.; Laban Dennis, M. D.; William S. Disbrow, M. D.; H. C. H. Herold, M. D.; William T. Hunt.
Paterson: Frank E. Agnew, M. D.; John Lainy Leal, M. D.; Bryan C. Magennis, M. D.; E. J. Marsh, M. D.
Princeton: C. F. Brackett, M. D.; Hon. Grover Cleveland (honorary); A. A. Woodhull, M. D.
Trenton: John C. Smock.

NEW MEXICO.

Albuquerque: James H. Wroth, M. D.

NEW YORK.

Albany: *Harry W. Carey, M. D.; F. C. Curtis, M. D.; *Herbert D. Pease, M. D.; T. A. Stuart.
Brooklyn: A. N. Bell, M. D.; *Daniel D. Jackson; Eliza M. Mosher, M. D.; Joseph H. Raymond, M. D.; Charles H. Shepard, M. D.; *Ezra H. Wilson, M. D.; McDonough Craven, C. E.
Buffalo: Thos. G. Allen, M. D.; *William G. Bissell, M. D.; J. T. Cook, M. D.; Walter D. Greene, M. D.; William Hengerer, M. D.; Henry R. Hopkins, M. D.; William B. May, M. D.; Jacob S. Otto, M. D.; Gustav Pohl, M. D.; William Scott Renner, M. D.; F. Simon, M. D.; T. Guilford Smith; *Eugene Wasdin, M. D.; Ernest Wende, M. D.; John Wende, M. D.; Herbert U. Williams, M. D.
Flushing: E. A. Goodridge, M. D.
Governor's Island: W. C. Gorgas, M. D.
Herkimer: A. Walter Suiter, M. D.
Ithaca: E. M. Chamot; *Veranus A. Moore, M. D.; W. F. Willcox.
Mt. Morris: Jacob Moyer Hagey, M. D.
Mt. Vernon: Edward F. Brush, M. D.
New York: Grace Adgate; Clark Bell; Emily Blackwell, M. D.; *Bertram H. Buxton, M. D.; C. F. Chandler; William S. Crandall; J. James R. Croes, C. E.; William E. Dodge, Jr.; F. Ferguson, M. D.; *R. G. Freeman, M. D.; Albert Fries, M. D.; *George W. Fuller,; William Paul Gerhard, C. E.; S. S. Goldwater, M. D.; *Allen Hazen, C. E.; Rudolph Hering, C. E.; G. Everett Hill, C. E.; Philip H. Hiss, Jr., M. D.; *Eugene Hodenpyl, M. D.; *J. H. Huddleston, M. D.; Geo. A. Johnson; Emil Kuichling, C. E.; Daniel Lewis, M. D.; Charles Marchand; David Percy Morgan; Moreau Morris, M D.; W. F. Morse, S. E.; John T. Nagle, M. D.; *William H. Park; Charles L. Parmalee; *T. Mitchell Prudden, M. D.; Edgar Richards; Charles F. Roberts, M. D.; Warren Schoonover, M. D.; Louis L. Seaman, M. D.; George Percival Shute, S. E.; Stephen Smith, M. D.; George A.

*Also members of Section of Bacteriology and Chemistry

Soper, Ph. D.; *James H. Stebbins, Ph. D.; Nathan Strauss; Mrs. Elizabeth Thompson (honorary); William C. Tucker, C. E.; Fred C. Valentine M. D.; G. C. Whipple; Alfred T. White, M. D.; William A. White, M. D.

Niagara Falls: J. H. Meehan, M. D.; Walter A. Scott, M. D.

Quarantine, S. I.: Alvah H. Doty, M D.

Rochester: Charles Wright Dodge; George W. Goler, M. D.; Henry Lomb (life).

Schenectady: Olin H. Landreth, C. E.

Stapleton: P. H. Bailhache, M. D.

Syracuse: Frederick W. Smith, M. D.

Troy: *James M. Caird.

NORTH CAROLINA.

Asheville: Samuel W. Battle, M. D.; James A. Burroughs, M. D.

Elizabeth City: W. J. Lumsden, M. D.

Raleigh: Richard H. Lewis, M. D.

Winston-Salem: Jacob Lott Ludlow, C. E.

OHIO.

Canton: Josiah Hartzell, Ph. D.

Cincinnati: P. S. Connor, M. D.; William H. Crane, M. D.; Clark W. Davis, M. D; *J. W. Ellms; Frank L. Fales, C. E.; Byron Stanton, M. D.

Cleveland: D. H. Beckwith, M. D.; William T. Miller, M. D.; *Roger G. Perkins, M. D.

Columbus: John P. Force, C. E.; *E. G. Horton; C. O. Probst, M. D.; Frank Warner, M. D.

Forest: William T. Gemmill, M. D.

Middletown: C. Monjeau, C. E.

Salem: T. T. Church, M. D.

Sidney: Henry E. Beebe, M. D.

Toledo: Walter W. Brand, M. D.; William C. Chapman, M. D.

Youngstown: W. L. Buechner, M. D.

Zanesville: J. C. Crossland, M. D.

OREGON.

Astoria: Alfred Kinney, M. D.

PENNSYLVANIA.

Abington: A. N. Baggs, M. D.

Allegheny: Thomas Turnbull, M. D.

Altoona: Charles P. Dudley, M. D.

Bloomsburg: Samuel B. Arment, M. D.

Boiling Springs: Milton A. Embich.

Central Valley: Grace A. Van Everen Stoughton.

Erie: John W. Wright, M. D.

Glenolden: W. F. Elgin, M. D.; J. J. Kinyoun, M. D.

Greensburg: R. B. Hammer, M. D.

Johnstown: W. E. Matthews, M. D.

McKeesport: William F. Knox, M. D.

Norristown: Simeon Trenner.

*Also members of Section of Bacteriology and Chemistry.

Philadelphia: A. C. Abbott, M. D.; H. S. Anders, M. D.; *William L. Coplin; Seneca Egbert, M. D.; Thomas H. Fenton, M. D.; Joseph S. Evans, Jr., M. D.; Lawrence F. Flick, M. D.; S. H. Gilliland, M. D.; J. Louis Good; John W. Hill, C. E.; William W. Justice; Charles W. Karsner, M. D.; Minnie M. Kendrick; S. S. Kneass, M. D.; Benjamin Lee, M. D.; Joseph McFarland, M. D.; P. A. Maignen; Charles Mohr, M. D.; Henry K. Mulford; J. L. Neff, M. D.; Leonard Pearson, V. M. D.; *M. P. Ravenel, M. D.; Oscar Samostz; Joseph Rome Smith, M. D.; *Alfred Stengel, M. D.

Pittsburg: W. H. Coster; Crosby Gray; *Morris Knowles, C. E.; J. H. McClelland, M. D.; * E. G. Matson, M. D.

South Bethlehem: *Thomas M. Drown, M. D.

West Fairview: Harvey B. Bashore, M. D.

New York: A. N. Stark, M. D.

Williamsport: Charles Youngerman, M. D.

York: A. B. Farquhar; Isaac C. Gable, M. D.; Roland Jessop, M. D.

PHILLIPINE ISLANDS.

Manila: Charles Richards, M. D.

PORTO RICO.

San Juan: William Fawcett Smith, M. D.

RHODE ISLAND.

Providence: *Ernest F. Badger; Charles V. Chapin, M. D.; *Fred P. Gorham; Samuel M. Gray, C. E.; John Edward Hill; Helen C. Putnam, M. D.; *Gardner T. Swarts, M. D.

SOUTH CAROLINA.

Charleston: J. Mercier Green, M. D.; *Robert Wilson, Jr., M. D.

TENNESSEE.

Knoxville: Wellington Donaldson.

Memphis: Marcus Haase, M. D.; Heber Jones, M. D.

TEXAS.

Dallas: John H. Florence, M. D.; J. H. Smart, M. D.

El Paso: Edward Alexander, M. D.

Houston: Tom A. Williams, M. D.

San Antonio: Julius Braunnagel, M. D.

VERMONT.

Bellows Falls: Edward Campbell, M. D.; George R. Wales.

Brattleboro: Henry D. Holton, M. D.

Burlington: Charles P. Moat; *Bingham H. Stone, M. D.; M. J. Wiltse.

Derby Line: F. G. Butterfield.

Rutland: Charles S. Caverly, M. D.

*Also members of Section of Bacteriology and Chemistry.

VIRGINIA.

Manassas: Imogene S. Pierce.
Richmond: Reuben Shirreffs, C. E.

WASHINGTON.

Seattle: James B. Eagleson, M. D.

WEST VIRGINIA.

Fairmont: Jas. H. Brownfield, M. D.

WISCONSIN.

Ashland: George W. Harrison, M. D.
Beloit: Erastus G. Smith, Ph. D.
Fond Du Lac: J. Henry McNeil, M. D.
Janesville: Quincy O. Sutherland, M. D.
La Crosse: F. L. Suiter, M. D.
Madison: *H. L. Russell.
Milwaukee: Solon Marks, M. D.; F. W. Shulz, M. D.; U. O. B. Wingate, M. D.
Wausau: Leonard E. Spencer, M. D.

*Also members of Section of Bacteriology and Chemistry.

SANITARY AUTHORITIES AND ASSOCIATIONS

OF THE

UNITED STATES OF AMERICA, THE DOMINION OF CANADA, THE REPUBLIC OF CUBA, AND THE REPUBLIC OF MEXICO.

1904.

AMERICAN PUBLIC HEALTH ASSOCIATION.

President, Dr. Carlos J. Finlay.....Havana, Cuba.
First Vice President, Dr. Jésus E. Monjáras.....Mexico, Mexico.
Second Vice President, Dr. William C. Woodward.....Washington, D. C.
Secretary, Dr. Charles O. Probst.....Columbus, Ohio.
Treasurer, Dr. Frank W. Wright .....New Haven, Conn.

CONFERENCE OF STATE AND PROVINCIAL BOARDS OF HEALTH OF NORTH AMERICA.

President, Dr. John S. Fulton.....Baltimore ,Md.
Vice President, N. K. Foster.....San Francisco, Cal.
Secretary, Dr. Gardner T. Swarts.....Providence, R. I.
Treasurer, Dr. J. A. Egan.....Spingfield, Ill.

PUBLIC HEALTH AND MARINE HOSPITAL SERVICE OF THE UNITED STATES.

Surgeon-General, Dr. Walter Wyman, Washington, D. C.
(Holds annual conference with delegates from state and territorial boards of health.)

CANADA.

Provincial Boards of Health.

BRITISH COLUMBIA.

John Chapman Davie, M. D., *Chairman,* Victoria; John Mathew Lefevre, M. D., Vancouver; Richard Eden Walker, M. D., New Westminster; Louis Thomas Davis, M. D., Nanaimo; C. F. Fagan, M. D., *Secretary,* Victoria.

MANITOBA.

R. M. Simpson, M. D., *Chairman,* Winnipeg; J. A. Macdonald, M. D., Brandon; Fred L. Schaffner, M. D., Boissevain; Dr. J. M. Eaton, Carberry; Gordon Bell, M. D., Winnipeg; E. M. Wood, Winnipeg, *Secretary.*

NEW BRUNSWICK.

Hon. Jas. Holly, St. John, *Chairman;* E. Bayard Fisher, M. D., Fredericton, *Secretary;* John McMillan, St. John; Joseph Benson, M. D., Chatham; W. N. Hand, M. D., Woodstock; J. H. Barry, Frederickton; C. O. Steeves, M. D., Moriston.

NOVA SCOTIA.

[Department of Public Health.]

Hon. G. H. Murray, Premier and Provincial Secretary, *Chairman;* A. P. Reid, M. D., *Provincial Health Officer,* Middleton.

ONTARIO.

E. E. Kitchen, M. D., *Chairman,* St. George; J. J. Cassidy, M. D., Toronto; R. P. Boucher, M. D., Petersborough; Wm. Oldright, M. D., Toronto; W. J. Douglas, M. D., Cobourg; A. Thompson, M. D., Strathroy; Chas. A. Hodgetts, M. D., *Secretary,* Toronto.

QUEBEC.

Dr. E. P. Lachapelle, *President,* Montreal; Dr. Elzear Pelletier, *Secretary,* Montreal; Dr. J. A. Beaudry, *Inspector of Health,* Montreal; Dr. R. F. Ruttan, *Chemist,* Montreal; Dr. Paul E. Prévost, *Recorder of Vital Statistics,* Montreal; Dr. J. W. Bonnier, *Assistant Inspector;* Dr. J. A. Chopin, *Assistant Bacteriologist and Chemist,* Montreal; Members: H. R. Gray, Esq., Montreal; Dr. Robert Craik, Montreal; Dr. Laurent Catellier, Quebec; Dr. Pantaléon Pelletier, Sherbrooke; Dr. Arthur Simard, Quebec; Dr. J. P. L. Bissonnette, St. Esprit; Engineers: Georges Janin, C. E.; R. S. Lea, C. E.; J. E. Doré, C. E.

CUBA.

SUPERIOR SANITARY BOARD.

Dr. Carlos J. Finlay, Chief Sanitary Officer, *President,* Havana; Active Members: Dr. Julio San Martin, President of the Commission of Special Hygiene, Havana; Dr. Enrique B. Barnet, *Secretary of the Board,* Havana; Dr. Juan Guiteras, Representative from the Western part of the Island, Havana; Dr. Ambrosio Grillo, Representative from the Eastern part of the Island, Santiago de Cuba. Honorary Members: Dr. Hugo Roberts, Chief of the Marine Hospital Service of the Island, Havana; Dr. Joaquin L. Jacobsen, President of the Tuberculosis League, Havana; Dr. Juan Santos Fernandez, Member of the Academy of Sciences, Havana; Dr. José Varela Zequeira, Member of the University of Havana, Havana; Dr. Gonzalo Aróstegui, Member of the Board of Education, Havana; Dr. José del Cueto y Pazos, Legally qualified lawyer, Havana.

MEXICO.

DISTRITO FEDERAL.

CONSEJO SUPERIOR DE SALUBRIDAD.

Presidente, Dr. Eduardo Licéaga, Rosales 37.
Secretario, Dr. José Ramírez, 10a de la Violeta 21.
Vocal, Dr. Domingo Orvañanos, Chavarría 25.
Vocal, Dr. Nicolás Ramírez de Arellano, 10a de la Violeta 1018.
Vocal, Dr. Joaquin Huici, 2a Guerrero.
Vocal, Dr. Luis E. Ruiz, Avenida Poniente 20 B número 2049.
Vocal, Dr. Fernando López, la de Mesones 11.

Vocal Médico Veterinario, Professor José L. Gómez, Cocheras 12.
Vocal Farmacéutico, Professor José D. Morales, 2a de Vanegas 9.
Vocal Abogado, Lic. Luis Elguero, Donceles 8.
Vocal Ingeneiro, Miguel Quevedo, Eliseo.

UNITED STATES.

State Boards of Health.

ALABAMA.

Dr. W. H. Sanders, *State Health Officer,* Montgomery. (The Medical Association of the State of Alabama constitutes the State Board of Health, with a committee of ten (10) members, called "A Public Health Committee," to represent and act for the Board during the intervals of its sessions.)

DISTRICT OF ALASKA.

(Has no District Board of Health.)

ARIZONA.

[Territorial Board of Health.]

Col. Alexander O. Bradie, Governor, *President,* Phoenix; Hon. Edw. W. Wells, Attorney General, *Vice President,* Phoenix; Dr. R. M. Dodsworth, *Superintendent and Secretary,* Phoenix.

ARKANSAS.

Dr. G. M. D. Cantrell, *President,* Little Rock; Dr. R. B. Christian, *Secretary,* Little Rock; Dr. W. H. Miller, Little Rock; Dr. W. B. Hughes, Little Rock; Dr. Wm. W. Jackson, Jonesboro; Dr. J. R. Lynn, Hazen.

CALIFORNIA.

Martin Regensburger, M. D., *President,* San Francisco; Wallace A. Briggs, M. D., Sacramento; A. C. Hart, M. D., Sacramento; F. K. Ainsworth, M. D., San Francisco; O. Stansbury, M. D., Chico; W. Le Moyne Wills, M. D., Los Angeles; N. K. Foster, *Secretary,* Sacramento.

COLORADO.

J. N. Hall, M. D., *President,* Denver; Wm. H. Davis, M. D., *Vice President,* Denver; F. N. Carrier, M. D., *Treasurer,* Canon City; Claude E. Cooper, M. D., *Secretary,* Denver; Dr. Hubert Work, Pueblo; Dr. J. C. Chipman, Sterling; Dr. Oliver J. Mayne, Como; Dr. H. S. Torrance, Cripple Creek; Dr. J. Tracy Melvin, Saguacges.

CONNECTICUT.

Prof. Wm. H. Brewer, Ph. D., LL. D., *President,* New Haven; Prof. C. A. Lindsley, M. D., A. M., *Secretary,* New Haven; T. H. McKenzie, Esq., Southington; E. K. Root, M. D., Hartford; H. G. Newton, B. A., Esq., New Haven; J. H. Townsend, M. D., New Haven; A. W. Phillips, M. D., Derby.

DELAWARE.

Dr. E. W. Cooper, *President,* Camden; Dr. A. E. Frantz, Wilmington; Dr. L. M. Cahall, Gridgeville; Dr. Alex. Lowber, *Secretary and Executive Officer,* Wilmington; Dr. J. W. Clifton, Smyrna; Dr. J. W. DeWitt, St. Georges; Dr. A. J. Fleetwood, Laurel.

DISTRICT OF COLUMBIA.

Dr. William C. Woodward, *Health Officer,* Washington, D. C.

FLORIDA.

Hon. E. M. Hendry, Tampa; Hon. N. B. Broward, Jacksonville; Hon. Horace L. Simpson, M. D., Pensacola; Joseph Y. Porter, M. D., *Secretary and State Health Officer,* Jacksonville and Key West.

GEORGIA.

Dr. W. F. Westmoreland, *President,* Atlanta; Dr. Charles Hicks, *Vice President,* Dublin; Dr. H. F. Harris, *Secretary,* Atlanta; Dr. W. W. Owens, Savannah; Dr. A. P. Taylor, Thomasville; Dr. M. S. Brown, Fort Valley; Dr. W. W. Stewart, Columbus; Dr. Howard J. Williams, Macon; Dr. R. M. Harbin, Rome; Dr. Samuel C. Benedict, Athens; Dr. Giles Hathcock, Bellton; Dr. J. B. Morgan, Augusta.

HAWAII.

(Territorial Board of Health.)

Dr. C. B. Cooper, *President*; Dr. J. S. B. Pratt, *Chief Health Officer;* C. Charloch, *Secretary* Dr. W. H. Mays, L. Andrews, Esq., M. P. Robinson, Esq., F. C. Smith, Esq., E. C. Winston, Esq. S. K. Kane, Esq. Office of the Board is in Honolulu.

IDAHO.

Idaho has no State Board of Health, nor is there any one acting in lieu of such board. A statute authorizes the Board of County Commissioners in each county to appoint a County Physician, who, together with the Board of Commissioners, constitute a board of health. This board has jurisdiction in the county only.

ILLINOIS.

Geo. W. Webster, M. D. *President,* Chicago; James A. Egan, M. D., *Secretary,* Springfield; W. Harrison Hipp, M. D., Chicago; P. H. Wessel, M. D., Moline; Henry Richings, M. D., Rockford; J. C. Sullivan, M. D., Cairo; C. B. Johnson, M. D., Champaign.

INDIANA.

W. N. Wishard, M. D., *President,* Indianapolis; Clark Cook, M. D.; *Vice-President,* Fowler; T. Henry Davis, M. D., Richmond; C. M. Eisenbeiss, M. D., Elkhart; J. N. Hurty, M. D., *Secretary,* Indianapolis.

INDIAN TERRITORY.

Cherokee — National Board of Health, Dr. F. B. Fite, *Secretary,* Muscogee. Board of Health Choctaw Nation — Dr. W. B. Hailey, *President,* Wilberton; Dr. B. L. Denison, *Vice-President,* Garvin; Dr. LeRoy Long, *Secretary,* Caddo.

IOWA.

Charles M. Mullan, Attorney-General, Waterloo; Paul O. Koto, Forest City, State Vet. Surgeon; Charles Francis, C. E., Davenport; J. A. McKlveen, M. D., *President,* Chariton; H. Matthey, M. D., Davenport; R. E. Coniff, M. D., Sioux City; Fred W. Powers, M. D., Waterloo; J. H. Sams, M. D., Clarion; A. M. Linn, M. D., Des Moines; A. P. Hanchett, M. D., Council Bluffs; J. F. Kennedy, M. D., *Secretary.*

KANSAS.

G. E. Locke, M. D., *President,* Holton; J. B. Carver, M. D., Fort Scott; B. J. Alexander, M. D., Hiawatha; A. S. Gish, M. D., Abilene; L. A. Golden, M. D., Kensington; S. J. Crumbine, M. D., Dodge City; M. N. Gardner, M. D., Greenleaf; E. P. Mills, M. D., Olathe; Charles Lowry, M. D., Topeka, *Secretary and Executive Officer;* F. O. Marvin, A. M., M. Am. Soc. C. E., Lawrence, *Sanitary Adviser and Civil Engineer;* E. H. S. Bailey, Ph. D., Lawrence, *Chemist;* Sarah E. Greenfield, M. D., Topeka, *Bacteriologist.*

KENTUCKY.

Joseph M. Mathews, M. D., *President,* Louisville; J. N. McCormack, M. D., *Secretary,* Bowling Green; William Bailey, M. D., Louisville; Geo. T. Fuller, M. D.; Mayfield; F. O. Young, M. D., Lexington; Chester A. Mayer, M. D., Louisville; I. A. Shirley, M. D., Winchester.

LOUISIANA.

Dr. Edmond Souchon, *President,* New Orleans; Dr. James Cronan Eagan, Shreveport; Dr. Theophilus T. Tarlton, Grand Coteau; Dr. Percival B. McCutchon, New Orleans; Dr. Whyte Glendower Owen, White Castle; Dr. Joseph S. Stephens, Natchitoches; Dr. Arthur Nolte, New Orleans; Dr. G. Farrar Patton, *Secretary,* New Orleans.

MAINE.

Charles D. Smith, M. D., *President,* Portland; E. C. Jordan, C. E., Portland; Prof. F. C. Robinson, Brunswick; G. M. Woodcock, M. D., Bangor; M. C. Wedgwood, M. D., Lewiston; Richard H. Stubbs, Augusta; A. G. Young, M. D., *Secretary,* Augusta.

MARYLAND.

Dr. Wm. H. Welch, *President,* Baltimore; Dr. John S. Fulton, *Secretary,* Baltimore; Dr. Eugene Jones, Kensington; Dr. James Bosley (ex-officio), Commissioner of Health of Baltimore City; Mr. H. Douglas Thomas, Jr., Baltimore; Hon. William Shephard Bryan, (ex-officio) Attorney-General, Baltimore; Dr. E. J. Dirickson, Berlin.

MASSACHUSETTS.

Henry P. Walcott, M. D., *Chairman,* Cambridge; Julian A. Mead, M. D., Watertown; Hiram F. Mills, C. E. Lawrence; John W. Bartol, M. D., Boston; Gerard C. Tobey, Esq., Wareham; James W. Hull, Pittsfield; Charles H. Porter, Quincy; Samuel W. Abbott, M. D., *Secretary,* Boston.

MICHIGAN.

Hon. Frank Wells, *President,* Lansing; Henry B. Baker, M. D., *Secretary,* Lansing; Charles M. Ranger, A. B., Battle Creek; Collins H. Johnston, M. D., Grand Rapids; D. A. MacLachlan, M. D., Detroit; Victor C. Vaughan, M. D., Ann Arbor; Hon. Henry A. Haigh, Detroit.

MINNESOTA.

Henry Hutchinson, M. D., *President,* St. Paul; W. H. Rowe, M. D., *Vice-President,* St. James; H. M. Bracken, M. D., *Secretary and Executive Officer,* St. Paul; B. J. Merrill, M. D., Stillwater; C. H. Mayo, M. D., Rochester; C. W. More, M. D., Eveleth; M. McKinnon, M. D., Fosston; Edw. Schumpik, D. D. S., Minneapolis; J. B. McGaughey, M. D., Winona.

MISSISSIPPI.

B. F. Ward, M. D., *President,* Winona; J. F. Hunter, M. D., *Secretary,* Jackson; W. S. Green, M. D., Aberdeen; G. H. McNeill, M. D., Newton; W. M. Paine, M. D., Aberdeen; J. D. Donald, M. D., Hattiesburg; E. P. Jones, M. D., Hermanville; J. D. Smythe, M. D., Greenville; W. H. Harrison, M. D., Tutwiler; P. W. Rowland, M. D., Oxford; J. R. Tackett, M. D., Meridian; J. A. Crisler, M. D., Yazoo City; J. H. Rhodes, M. D., Jackson.

MISSOURI.

A. W. McAlester, M. D., *President,* Columbia; W. F. Morrow, M. D., *Secretary,* Kansas City; R. H. Goodier, M. D., Hannibal; D. T. Powell, M. D., Thayer; J. T. Thatcher, M. D., Oregon; J. A. B. Adcock, M. D., Warrensburg; M. M. Hamlin, M. D., St. Louis

MONTANA

Hon. Joseph K. Toole, Governor, (ex-officio) Helena; Hon. James Donavon, Attorney-General (ex-officio) Helena; Dr. William Treacy, *President,* Helena; Dr. Thomas D. Tuttle, *Secretary,* Helena; Dr. LeRoy Southmayd, Great Falls; Dr. James L. Belcher, Townsend; Mr. J. W. Wade, C. E., Helena.

NEBRASKA.

Benj. F. Bailey, *President,* Lincoln; W. T. Johnson, Pawnee City; A. B. Somers, *Treasurer,* Omaha; Geo. H. Brash, *Secretary,* Beatrice; S. R. Towne, Omaha, State Health Inspector.

NEVADA.

S. C. Gibson, M. D., *President,* Reno; W. L. Samuels, M. D., *Vice President,* Winnemucca; S. L. Lee, M. D., *Secretary,* Carson City.

NEW HAMPSHIRE.

Governor Nahum J. Bachelder, Andover; Attorney-General E. G. Eastman, Exeter; G. P. Conn, M. D., *President,* Concord; Chas. S. Collins, M. D., Nashua; Robert Fletcher, C. E., Hanover; Irving A. Watson, M. D., *Secretary,* Concord.

NEW JERSEY.

Cyrus F. Brackett, M. D., LL. D., *President,* Princeton; the Secretary of State, the Attorney-General, the State Geologist, members ex-officio; Laban Dennis, M. D., Newark; Henry B. Rue, M. D, Hoboken; Henry W. Elmer, M. D., Bridgeton; Wm. H. Murray, M D., Plainfield; George P. Olcott, C. E., East Orange; Henry Mitchell, M. D., *Secretary and Medical Superintendent of Vital Statistics,* Asbury Park. The office of the Board is in the State House, Trenton.

NEW MEXICO.

Dr. G. W. Harrison, *President,* Albuquerque; Dr. M. F. Desmaris, *Vice-President,* Santa Rosa; Dr. W. D. Radcliffe, *Treasurer,* Belen; Dr. B. B. Black, *Secretary,* Las Vegas; Dr. J. H. Sloan, Santa Fe; Dr. G. C. Bryan, Alamogordo; Dr. J. J. Shuler, Raton.

NEW YORK.

(State Department of Health.)

Dr. Daniel Lewis, *Commissioner of Health,* New York, T. A. Stuart, *Chief Clerk,* Albany.

NORTH CAROLINA.

George G. Thomas, M. D., *President,* Wilmington; Richard H. Lewis, M. D., *Secretary and Treasurer,* Raleigh; S. Westray Battle, M. D., Asheville; Henry W. Lewis, M. D., Jackson; W. P. Ivey, M. D., Lenoir; Francis Duffy, M. D., New Bern; W. H. Whitehead, M. D., Rocky Mountains; J. J. Ludlow, C. E., Winston; J. L. Nicholson, M. D., Richlands.

NORTH DAKOTA.

C. N. Frich, *President,* Bismarck; G. F. Erskine, *Vice-President,* Hamilton; H. H. Healy, M. D., *Superintendent and Secretary,* Grand Forks.

OHIO.

Wm. T. Miller, M. D., *President,* Cleveland; Frank Warner, M. D., *Vice-President,* Columbus; C. O. Probst, M. D., *Secretary,* Columbus; W. C. Chapman, M. D., Toledo; Josiah Hartzell, Ph. D., Canton; Darwin G. Palmer, M. D., Geneva; Byron Stanton, M. D., Cincinnati; J. C. Crossland, M. D., Zanesville.

OKLAHOMA TERRITORY.

Dr. B. F. Hamilton, *President,* Shawnee; Dr. E. G. Sharp, *Vice-President,* Guthrie; Dr. E. E. Cowdrich, *Secretary and Superintendent,* Enid.

OREGON.

Dr. Andrew C. Smith, *President,* Portland; Dr. E. A. Pierce, *Vice-President,* Salem; Dr. Woods-Hutchinson, *Secretary,* Portland; Dr. Alfred Kenny, Astoria; Dr. E. B. Pickel, Medford; Dr. C. J. Smith, Pendleton.

PENNSYLVANIA.

Samuel T. Davis, M. D., *President,* Lancaster; John Fulton, C. E., Johnstown; Prof. Geo. G. Groff, M. D., Lewisburg; J. H. McClelland, M. D., Pittsburg; Charles H. Harvey, M. D., Philadelphia; M. A. Embick, Boiling Springs; Benjamin Lee, M. D., *Secretary,* Philadelphia.

PHILLIPINE ISLANDS.

(Insular Board of Health.)

Maj. E. C. Carter, M. D., U. S. Army, *Commissioner of Health;* Capt. E. L. Munson, M. D., U. S. Army, *Assistant Commissioner of Health;* H. D. Osgood, B. S., *Sanitary Engineer;* T. R. Marshall, M. D., *Chief Health Inspector;* P. C. Freer, M. D., Ph. D., *Superintendent Government Laboratories;* Manuel Gomez Martinez, M. D., *Secretary.* Office of the Board is in Manila.

PORTO RICO.

(Superior Board of Health.)

Dr. Jose Gomez Briose, *Director of Health, Charities and Corrections;* Dr. Francisco R. De Goenaga, *Acting Supervisor of Health.* Members of the Board:— Dr. F. R. Geonaga, Dr. Esteban Saldana, Mr. Juan Hernandez Lopez, Mr. Fidel Guillermety. Office of the Board is in San Juan.

RHODE ISLAND.

Albert G. Sprague, M. D., *President,* Riverpoint; Samuel M. Gray, C. E., Providence; Alexander B. Briggs, M. D., Ashaway; Rev. George L. Locke, Bristol; John C. Budlong, M. D., Providence; Rufus E. Darrah, Newport; Gardner T. Swarts, M. D., *Secretary,* Providence.

SOUTH CAROLINA.

T. Grange Simons, M. D., *Chairman,* Charleston; A. A. Moore, M. D., Camden; James Evans, M. D., *Secretary,* Florence; W. H. Nardin, Anderson; Chas. M. Rees, M. D., Charleston; George R. Dean, M. D., Spartanburg; Robert Wilson, M. D., Charleston; Hon. U. X. Gunter, Attorney General; Hon. A. W. Jones, Comptroller General.

SOUTH DAKOTA.

Dr. D. W. Robinson, *Chairman,* Pierre; Dr. A. L. Peterman, Parker; Dr. J. W. Ellis, Elk Point; Dr. H. A. Peabody, Webster; Dr. T. W. Moffitt, Deadwood.

TENNESSEE.

W. J. McMurray, M. D., *President,* Nashville; Heber Jones, M. D., *Vice President,* Memphis; W. J. Miller, M. D., Johnson City; Hon. Thomas H. Paine (ex-officio member), Nashville; J. A. Albright, M. D., *Secretary and Executive Officer,* Nashville. The Secretary is not a member of the Board.

TEXAS.

[State Health Department.]

Dr. George R. Tabor, *State Health Officer,* Austin; Emmett E. Walker, *Clerk,* Austin.

UTAH.

F. S. Bascom, M. D., *President,* Salt Lake City; T. B. Beatty, M. D., *Secretary,* Salt Lake City; W. R. Calderwood, Logan; S. H. Allen, M. D., Salt Lake City; Frank B. Steele, M. D., Salt Lake City; Martha H. Cannon, M. D., Salt Lake City; A. F. Doremus, C. E., Salt Lake City.

VERMONT.

Dr. C. S. Caverly, *President,* Rutland; Dr. H. D. Holton, *Secretary,* Brattleboro; Dr. Truman R. Stiles, St. Johnsbury.

VIRGINIA.

Dr. R. W. Martin, *President,* Lynchburg; Dr. V. G. Culpepper, Portsmouth; Dr. Landon B. Edwards, Richmond; Dr. Lewis E. Harvie, Danville; Dr. J. H. Neff, Harrisonburg; Dr. Paulus A. Irving, *Secretary,* Richmond; Dr. M. D. Hoge, Jr., *Bacteriologist,* Richmond.

WASHINGTON.

S. B. Nelson, D. V. M., *President,* Pullman; Elmer E. Heg, M. D., *Secretary,* Seattle; C. P. Gammon, M. D., Walla Walla; J. R. Yocum, M. D., Tacoma; J. M. Semple, M. D., Spokane.

WEST VIRGINIA.

Dr. A. N. Frame, *President,* Parkersburg; Dr. H. A. Barbee, *Secretary and Executive Officer,* Point Pleasant; Dr. D. P. Morgan, Clarksburg; Dr. J. L. Dickey, Wheeling; Dr. S. N. Myers, Martinsburg; Dr. A. R. Warden, Grafton; Dr. A. G. Staunton, Charleston; Dr. J. E. Robins, Claremont; Dr. S. W. Varner, Glenville; Dr. C. W. Spangler, Maybeury.

WISCONSIN.

Wm. F. Whyte, M. D., *President,* Watertown; C. A. Harper, M. D., *Secretary and Executive Officer,* Madison; F. C. Suiter, M. D., LaCrosse; U. O. B. Wingate, M. D., Milwaukee; Q. O. Sutherland, M. D., Janesville; L. E. Spencer, M. D., Wausau; H. A. Meilike, M. D., Clintonville.

WYOMING.

Dr. Fred Horton, *President,* Newcastle; Dr. A. W. Barber, *Secretary and Executive Officer,* Cheyenne; Dr. J. L. Wicks, Evanston.

SANITARY ASSOCIATIONS.

CALIFORNIA.

State, County and Municipal Sanitary Conference.

Dr. Martin Regensburger, *President,* San Francisco; N. K. Foster, *Secretary,* Sacramento.

Public Health Commission of California.

Dr. Rupert Blue, *President,* San Francisco; Dr. Martin Regensburger, *Vice-President,* San Francisco; Dr. James W. Wood, *Vice-President,* San Francisco; Louis Leoy, *Secretary,* San Francisco.

CONNECTICUT.

New Haven County Public Health Association.

C. E. Hoadley, Esq., *President;* I. H. Townsend, M. D., *Vice President;* E. A. Wilson, M. D., *Secretary.*

INDIANA.

There is no voluntary State Sanitary Association. There are held under the auspices of the State Board of Health two health officers' schools annually. In June the school for county and city health officers is held. In December the health officers' school for town health officers, is held.

IOWA ASSOCIATION OF HEALTH OFFCERS.

Dr. L. A. Thomas, Red Oak, *President;* Dr. W. B. LaForce, Ottumwa, *Vice President;* Dr. C. T. Lesan, Mount Ayr, *Secretary and Treasurer.*

LOUISIANA STATE SANITATION ASSOCIATION.

Dr. James W. Dupree, *President,* Baton Rouge; Dr. Rudolph Matas, *First Vice President,* New Orleans; Dr. John N. Thomas, *Second Vice President,* Quarantine; Dr. W. G. Owen, *Third Vice President,* White Castle; Dr. Robert L. Randolph, *Fourth Vice President,* Alexandria, Dr. N. K. Vance, *Fifth Vice-President,* Shreveport; Dr. W. H. Dalrymple, Baton Rouge; Dr. C. P. Ducote, *Seventh Vice President,* Cottonplant; Dr. Benj. A. Littell, *Treasurer,* Opelousa; Dr. Frederick J. Mayer, *Secretary,* "Scott," Lafayette.

MARYLAND PUBLIC HEALTH ASSOCIATION.

Dr. Thos. B. Owings, *President,* Ellicott City; Dr. Roger Brooke, Sandy Spring; Dr. F. H. Thompson, Annapolis; Dr. C. R. Scheller, Hagerstown; Dr. E. J. Dirickson, Berlin; Dr. Chas. O'Donovan, Baltimore, *Vice Presidents;* Dr. W. R. Stokes, Baltimore, *Treasurer;* Dr. John S. Fulton, and Dr. Marshall L. Price, *Secretaries.*

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

Dr. H. P. Walcott, *President,* Cambridge; Dr. S. H. Durgin, *First Vice President,* Boston; Dr. S. W. Abbott, *Second Vice President,* Boston; James C. Coffey, *Secretary,* Worcester; Dr. James B. Field, *Treasurer,* Lowell.

MICHIGAN.

Sanitary conventions held one or more times each year at different towns in the State.

MINNESOTA STATE SANITARY ASSOCIATION.

[Organized 1892.[

F. F. Wesbrook, M. D., *President,* University of Minnesota, Minneapolis; G. L. Wilson, *First Vice President,* St. Paul; T. S. Roberts, M. D., *Second Vice President,* Minneapolis; E. H. Bayley, M. D., *Secretary,* Lake City; Frank Corbett, M. D., *Treasurer,* Minneapolis. Executive Committee: Prof. G, Frankfurter, Minneapolis; Henry Hutchinson, M. D., St. Paul; T. R. Huxley, M. D., Faribault. The association meets once a year.

MONTANA SANITARY ASSOCIATION.

Dr. T. J. Sullivan, Butte, *President;* Dr. R. E. Hathaway, Glendive, *Vice President;* Dr. Thomas D. Tuttle, Helena, *Secretary.*

NEW HAMPSHIRE ASSOCIATION OF BOARDS OF HEALTH.

Mr. Wm. K. Robbins, *President,* Manchester; Dr. Haven Palmer, *First Vice President,* Plymouth; Lemuel Pope, Jr., D. V. M., *Second Vice President,* Portsmouth; Dr. Irving A. Watson, *Secretary,* Concord; Dr. D. E. Sullivan, *Treasurer,* Concord.

NEW JERSEY SANITARY ASSOCIATION.

M. N. Baker, C. E., *President,* Monclair; N. L. Wilson, M. D., *First Vice President,* Elizabeth; Elias J. Marsh, M. D., *Second Vice President,* Paterson; H. M. Herbert, *Third Vice President,* Bound Brook; James A. Exton, M. D., *Secretary,* Arlington; George P. Olcott, C. E., *Treasurer,* East Orange; H. B. Francis, *Chairman Executive Council,* Camden.

NEW YORK.

An annual Sanitary Conference is held each year under the auspices of the State Health Department.

OHIO.

Joint meeting of state and local boards of health held in January each year. President and Secretary of State Board of Health, *ex-officio,* officers.

ASSOCIATION OF EXECUTIVE HEALTH OFFICERS OF ONTARIO.

J. W. Lane, M. D., *President,* Mallorytown; J. W. Bowlby, K. C., *Vice President,* Brantford; Chas. A. Hodgetts, *Secretary-Treasurer,* Toronto. Members of the Executive Council: P. H. Bryce, M. D., Ottawa; W. Chipman, M. D., Toronto; J. M. Shaw, M. D., Keene; R. P. Boucher, M. D., Peterborough; W. S. Richards, Esq., Chatham.

ASSOCIATED HEALTH AUTHORITIES AND SANITARIANS OF PENNSYLVANIA.

President, the Governor, *ex-officio; First Vice President,* H. H. Whitcomb, M. D., Norristown; *Second Vice President,* S. P. Heilman, M. D., Heilmandale; *Third Vice President,* T. N. McKee, M. D., Kittanning; *Secretary,* Wm. B. Atkinson, M. D., Philadelphia; *Treasurer,* Jesse C. Green, D. D. S., West Chester. Executive Committee: Benjamin Lee, M. D., *Chairman,* Philadelphia; I. C. Gable, M. D., York; Israel Cleaver, M. D., Reading; M. W. Raub, M. D., Lancaster; H. J. Repmam, M. D., Charleroi; J. S. Hileman, M. D., West Pittston (Pittsburg P. O.); John Fulton, C. E., Johnstown.

SOUTH CAROLINA SANITARY ASSOCIATION.

Dr. J. M. Reardon, Sumter, *President;* Dr. J. W. Folk, Georgetown, *Vice President;* Dr. J. Mercier Green, Charleston, *Secretary.*

INDEX.

A

Abbott, S. W.,
Discussion of Papers on Car Sanitation..... 265
Adams, George O., and Gage, Stephen DeM.,
Studies of Media for the Quantitative Estimation of Bacteria in Water and Sewage 398
A Dangerous Food Preservative..... 355
Address of Welcome 13, 17
Address, President's 1
A Differential Test for Typhoid and Colon Bacilli..... 367
Advisory Council, Report of 326
Amendment to Constitution 260, 321
Resolutions Endorsing American Congress on Tuberculosis..... 280
Ammonia, Methods for the Determination of Free and Albuminoid, in Sewage 354
A National Institute of Hygiene..... 239
Anderson, John F.,
Discussion of Paper on Plague..... 312
Remarks on the Preparation of Vaccine Virus..... 221
Animal Diseases and Animal Food,
A Test of the Immunity of Cattle Inoculated with Tuberculosis Over Against a Natural Exposure..... 402
B. Tuberculosis in Man and Animals..... 400
Discussion of Papers on 261
Report of Committee on 20
The Passage of Tubercle Bacilli Through the Normal Intestinal Wall 404
A Simple Method for the Routine Detection of the Colon Bacillus in Water 359
A Test of the Immunity of Cattle Inoculated with Tuberculosis Over Against a Natural Exposure 402
Auditing Committee, Appointment of 296
Report of 305

B

B. Coli,
A Detailed Study of 360
A Differential Test for Typhoid and Colon Bacilli..... 367
A Simple Method for the Routine Detection of the Colon Bacillus in Water 359
Isolation of from the Alimentary Tract of Fish..... 385
On Some Cultural Relations and Antagonisms of, and Houston's Sewage Streptococci 369
The Significance of, in Water Supplies..... 356
B. Tuberculosis,
Report of Committee on in Man and Animals..... 400
The Passage of, Through the Normal Intestinal Wall..... 404

Bacteriology, The Development of American..... 329
Bailey, William,
Discussion of papers on Yellow Fever..... 293
Baker, S. K., and Prescott, S. C.,
On Some Cultural Relations and Antagonisms of B. Coli and Houston's Sewage Streptococci..... 369
Bissell, Wm. G.,
The Bacterial Examination of 104 Samples of Water, Together With a Detailed Study of the Colon Bacillus..... 360
The Effect of Lemon Juice in the Mixture Known as Lemonade Upon Typhoid-Polluted Water 352
Bracken, H. M.,
Pertaining to the Transportation of the Dead..... 193
Brena, Juan,
On Car Sanitation in the Republic of Mexico..... 188
Bryce, Peter H.,
Discussion of Papers on Disposal of Garbage and Refuse..... 281

C

Canteens in Armies,
Discussion of Report on 302
Report of Committeee on 98
Resolutions in Regard to.....302, 323
Carroll, James,
Discussion of Papers on Yellow Fever..... 291
The Etiology of Yellow Fever..... 406
Car Sanitation,
Discussion of Papers on 265
In the Republic of Mexico..... 188
Pertaining to the Transportation of the Dead..... 193
Report of Committee on 167
Transportation of Persons Sick With Transmissible Diseases..... 184
Carter, Henry R.,
Discussion of Paper on Hydrocyanic Acid as an Insecticide..... 318
Discussion of Papers on Yellow Fever..... 290
Some Characteristics of the Stegomyia Fasciata Which Affect its Conveyance of Yellow Fever 50
Chase, H. Lincoln,
Discussion of Paper on Venereal Diseases..... 327
Cholera,
Factors Operative in the Spread and Management of..... 232
Clark, H. W., and Gage, Stephen DeM.
On the Value of Tests for Bacteria of Specific Types as an Index of Pollution 386
Comments on the Report of the Committee on the Etiology of Yellow Fever 47
Committees,
List of ix
On International Relations 324
On Publishing a Periodical 322
Concerning the Geographic Distribution of the Yellow Fever Mosquito.... 71
Conn, Granville P.,
Discussion of Papers on Car Sanitation..... 273

Conn, Granville P., Chairman,
Report of Committee on Car Sanitation..... 167
Constitution i
Amendment to 260, 321
Crane, W. H.,
Discussion of Paper on Venereal Diseases..... 325

D

Dead Bodies, Pertaining to the Transportation of..... 193
de Schweinitz, E. A., and Schroeder, E. C.,
A Test of the Immunity of Cattle Inoculated With Tuberculosis Over Against a Natural Exposure..... 402
Diphtheria, The Release of Quarantine in 341
Disinfection and Disinfectants,
Experimental Study of Hydrocyanic Acid as an Insecticide..... 214
Report of Committee on..... 208
Disinfection in Mexico 213
Dudley, Charles B.,
Discussion of Papers on Car Sanitation.....266, 270, 272, 273
Durgin, Samuel H.,
Discussion of Paper on Venereal Diseases..... 326

E

Egbert, Seneca,
Discussion of Papers on Vital Statistics..... 309
Eilinger, F. R., and Goler, G. W.,
Four Years' Experience in an Attempt to Make a Bacterial Count of 100,000 Bacteria per CC., a Standard for Municipal Milk Supply. 338
Election of Members 260
Election of Officers 323
Executive Committee, By-laws of vi
Experimental Study of Hydrocyanic Acid as an Insecticide..... 214
Eyes, Hygiene of in the Mexican Schools..... 250
Resolution in re Hygiene of the 327

F

Fabela, O. Gonzales,
Something about the Bacteriology and Clinical History of Plague. 255
Factors Operative in the Spread of a Cholera Epidemic and the Management of the Same from a Quarantine Standpoint..... 232
Filters, Report of Committee on Laboratory Tests of the Efficiency of Water 345
Finlay, Carlos J.,
Discussion of Papers on Animal Diseases and Animal Food.....263, 264
Discussion of Paper on Venereal Diseases..... 326
Discussion of Papers on Yellow Fever..... 288
New Aspects of the Etiology of Yellow Fever..... 68
Remarks by 324
Fish, Isolation of B. Coli from the Alimentary Tract of..... 385
Floors, The, of Hospital Wards..... 247
Four Years' Experience in an Attempt to Make a Bacterial Count of 100,000 Bacteria per CC. a Standard for Municipal Milk Supply. 338

Fuller, George W., Chairman,
Report of Committee on Purification of Water Supplies..... 91
Fulton, John S.,
Discussion of Paper on Hydrocyanic Acid as an Insecticide..... 315

G

Gage, Stephen DeM., and Adams, George, O.,
Studies of Media for the Quantitative Estimation of Bacteria in Water and Sewage 398
Gage, Stephen DeM., and Clark, H. W.,
On the Value of Tests for Bacteria of Specific Types as an Index of Pollution 386
Garbage and Refuse,
Discussion of Papers on 281
Disposal of Municipal and Institutional Waste by Cremation..... 134
Report of Committee on Disposal of..... 129
Report of Committee on Disposal of Industrial Wastes..... 166
Resolution in re Disposal of.....302, 322
Some Statistics of, for the Larger American Cities in 1902..... 141
Goler, G. W., and Eilinger, F. R.,
Four Years' Experience in an Attempt to Make a Bacterial Count of 100,000 Bacteria per CC. a Standard for Municipal Milk Supply 338
Goler, George W., Chairman,
Report of Committee on Sanitary Aid Societies..... 128
Gorgas, W. C.,
Period of the Disease in Man During Which Yellow Fever can be Tranmitted to the Mosquito 65
Guiteras, Juan,
Comments on the Report of the Committee on the Etiology of Yellow Fever 47
Discussion of Papers on Animal Diseases and Animal Food.....262, 264

H

Haase, M.,
Discussion of Papers on Car Sanitation..... 272
Discussion of Paper on Venereal Diseases..... 325
Hansen, P., and Winslow, C.-E. A.,
Some Statistics of Garbage Disposal for the Larger American Cities in 1902 141
Harrington, Charles,
A Dangerous Food Preservative 355
Harrison, F. C.,
A Differential Test for Typhoid and Colon Bacilli..... 367
Hering, Rudolph, Chairman,
Report of Committee on Disposal of Garbage and Refuse..... 129
Hering, Rudolph,
Discussion of Papers on Disposal of Garbage and Refuse..... 282
Houston's Sewage Streptococci, Some Cultural Relations and Antagonisms of B. Coli and 369

Howard, L. O.,
Concerning the Geographic Distribution of the Yellow Fever Mosquito 71
Hurty, John N.,
Discussion of Report on Teaching of Hygiene..... 299
Discussion of Paper on Transportation of Dead..... 276
Transportation of Persons Sick with Transmissible Diseases..... 184
Hydrocyanic Acid as an Insecticide,
Discussion of Papers on..... 315
Hydrocyanic Acid,
Experimental Study of, as an Insecticide..... 214
Hygiene,
A National Institute of 239
Report of Committee on the Teaching of 124
Discussion of Report on Teaching of 296
Resolutions in re the Teaching of.....301, 322, 323
Hygiene of the Eyes in the Mexican Schools..... 250

I

Immigration and the Public Health..... 224
Infant Mortality, Report of Committee on the Causes and Prevention of... 122
Institute of Hygiene, A National 239
International Relations, Committee on..... 324
Isolation of B. Coli from the Alimentary Tract of Fish and the Significance Thereof 385

J

Jones, Heber,
Discussion of Papers on Disposal of Garbage and Refuse..... 282
Discussion of Papers on Vital Statistics..... 308
Johnson, George A.,
Isolation of B. Coli from the Alimentary Tract of Fish and the Significance Thereof 385
Johnston, Wyatt,
Resolutions on the Death of..... 416

K

King, W. A., Chairman,
Report of Committee on Demography and Statistics in Their Sanitary Relation 201
Kober, George M., Chairman,
Report of Committee on Canteens in Armies..... 98
Kober, George M.,
Resolution in re Canteens in Armies.....302, 323
Resolution in re the Teaching of Hygiene.....301, 322
Kohnke, Quitman,
Discussion of Paper on Hydrocyanic Acid as an Insecticide..... 318
Discussion of Paper on Transportation of the Dead..... 275
Discussion of Paper on Venereal Diseases..... 325
Discussion of Papers on Yellow Fever 286

L

Laboratory Section,
Papers and Reports Presented to..... 329

Lee, Benjamin, Chairman,
Report of the Committee on the Teaching of Hygiene and the Conferring of a Degree in Public Health..... 124
Lee, Benjamin,
Discussion of Report on Teaching of Hygiene..... 301
Lemon Juice, The Effect of, on Typhoid-Polluted Water..... 352
Liceaga, Eduardo,
Reflections on the Desirability of an Agreement Between the Sanitary Authorities of Adjoining Countries for Mutual Defense Against Transmissible Disease 43
Lindsley, J. M.,
Discussion of Papers on Animal Diseases and Animal Food..... 263
Discussion of Papers on Car Sanitation..... 270
Discussion of Paper on Hydrocyanic Acid as an Insecticide..... 318
Discussion of Paper on International Agreement in Quarantine.... 278
Discussion of Paper on Venereal Diseases..... 326
Discussion of Papers on Yellow Fever.....291, 292
Quarantine Regulations Should be Based Against Yellow Fever upon the Doctrine That it is Only Conveyed by the Mosquito..... 81
Resolution in re Yellow Fever and Quarantine Regulations..... 294
List of Members..... xviii
Local Committee of Arrangements, Report of..... 259
Lopez, Fernando,
Experimental Study of Hydrocyanic Acid as an Insecticide..... 214

M

McCormack, J. N.,
Discussion of Papers on Car Sanitation.....270, 272
Discussion of Paper on Transportation of Dead..... 277
Discussion of Papers on Vital Statistics..... 306
McFarland, H. B. F.,
Address of Welcome 17
McLaughlin, A. J.,
Immigration and the Public Health..... 224
Marquez, M.,
The Floors of Hospital Wards..... 247
Marsh, E. J.,
Discussion of Papers on Vital Statistics.....305, 308
Mayer, Fred J.,
A National Institute of Hygiene 239
Measures for Restraining the Propagation of Venero-Syphilitic Diseases. 244
Members,
Elected at Washington xxix
List of, by Geographical Distribution..... xxx
Revised List of xviii
Methods for the Determination of Free and Albuminoid Ammonia in Sewage 354
Mexico,
Car Sanitation in 188
Disinfection in 213
Mexico City, The Mosquitoes in..... 77
Milk Supply, An Attempt to Establish a Standard of Municipal..... 338

Mitchell, Henry,
Discussion of Paper on Transportation of Dead..... 276
Mitchell, Henry, Chairman,
Report of Committee on the Causes and Prevention of Infant Mortality 122
Monjaras, Jesus E.,
Some Indications that May Serve for the Better Utilization of Vital Statistics 205
Resolution in re Vital Statistics..... 321
Montizambert, Frederick,
Discussion of Paper on Immigration..... 275
Morse, W. F.,
Resolution in re Disposal of Garbage and Refuse.....302, 322
The Sanitary Disposal of Municipal and Institutional Waste by Cremation 134
Mosquito,
Concerning the Geographic Distribution of the Yellow Fever..... 71
Period of the Disease in Man During Which Yellow Fever Can be Transmitted to the..... 65
Quarantine Regulations Against Yellow Fever Should be Based on the Doctrine That it is Only Conveyed by the..... 81
Mosquitoes (The), in Mexico City 77

N

New Aspects of Yellow Fever Etiology Arising from Experimental Findings of the Last Three Years..... 68
Newell, F. H.,
Discussion of Report on Purification of Water Supplies..... 282
Nolte, Arthur,
Discussion of Paper on Transportation of Dead..... 276
Discussion of Paper on Yellow Fever.....288, 293

O

Officers and Committees, List of..... ix
Officers, Election of 323
On Car Sanitation in the Republic of Mexico..... 188
On Some Cultural Relations and Antagonisms of B. Coli and Houston's Sewage Streptococci 369
On the Value of Tests for Bacteria of Specific Types as an Index of Pollution 386

P

Periodical, Committee on Publishing 322
Period of the Disease in Man During Which Yellow Fever Can Be Transmitted to the Mosquito 65
Pertaining to the Transportation of the Dead..... 193
Perry, J. C.,
Discussion of Paper on Plague..... 315
Factors Operative in the Spread and Management of a Cholera Epidemic 232
Phelps, Earle B.,
Methods for the Determination of Free and Albuminoid Ammonia in Sewage 354

Plague,
Discussion of Paper on 312
Something About the Bacteriology and Clinical History of..... 255
Prescott, S. C.,
The Significance of B. Coli in Water Supplies..... 356
Prescott, S. C., and Baker, S. K.,
On Some Cultural Relations and Antagonisms of B. Coli and Houston's Sewage Streptococci 369
President's Address 1
Probst, Charles O.,
Discussion of Report on Teaching of Hygiene..... 300
Proceedings of Thirty-first Annual Meeting..... 259
Porter, Joseph Y.,
Discussion of Paper on Transportation of Dead..... 277
Discussion of Papers on Yellow Fever.....289, 292

Q

Quarantine Regulations Should be Based Against Yellow Fever upon the Doctrine That it is Only Conveyed by the Mosquito..... 81
Quarantine,
Discussion of Paper on International Agreement in Quarantine.... 277

R

Reflections on Desirability of International Agreement Between the Sanitary Authorities of Adjoining Countries for Mutual Defense Against Transmissible Disease 43
Refuse, See "Garbage and Refuse."
Remarks on the Preparation of Vaccine Virus..... 221
Ravenel, Mazyck P., Chairman,
Report of Committee on B. Tuberculosis in Man and Animals..... 400
Ravenel, Mazyck P.,
The Passage of Tubercle Bacilli Through the Normal Intestinal Wall 404
The Relation Between Human and Bovine Tuberculosis..... 31
Report of Advisory Council 323
Report of Committee,
On Animal Diseases and Animal Food..... 20
On B. Tuberculosis in Man and Animals..... 400
On Canteens in Armies 98
On Car Sanitation 167
On Demography and Statistics in Their Sanitary Relation..... 201
On Disposal of Garbage and Refuse..... 129
On Disposal of Industrial Wastes 166
On Disinfection and Disinfectants 208
On Etiology of Yellow Fever 39
On Laboratory Tests of the Efficiency of Water Filters..... 345
On Purification of Water Supplies 91
On Resolutions on the Death of Wyatt Johnston..... 416
On Sanitary Aid Societies 128

On Teaching of Hygiene and the Conferring of a Degree in Public Health 124
On the Causes and Prevention of Infant Mortality..... 122
On the Significance of B. Coli in Water Supplies..... 356
Resolution in re,
American Congress on Tuberculosis 280
Canteens in Armies 302, 323
Disposal of Garbage and Refuse.....302, 322
Hygiene of the Eyes 327
Printing and Distributing Reports and Papers in Advance of Meeting 322
Publishing a Periodical 322
Registration of Vital Statistics..... 321
Teaching of Hygiene 301, 322, 323
Yellow Fever and Quarantine Regulations 294
Resolution of Thanks 327
Resolutions on Death of Wyatt Johnston 416
Robinson, F. C., Chairman,
Report of Committee on Disinfection and Disinfectants..... 208
Robinson, F. C.,
Discussion of Paper on Hydrocyanic Acid as an Insecticide..... 319
Ross, John W., Chairman,
Report of Committee on Etiology of Yellow Fever..... 39
Ross, John W.,
Discussion of Report on Canteens in Armies..... 303
Ruiz, Luis E.,
Disinfection in Mexico 213
The Mosquitoes in Mexico City..... 77
Russell, H. L.,
The Development of American Bacteriology..... 329

S

Salmon, D. E., Chairman,
Report of Committee on Animal Diseases and Animal Food..... 210
Salmon, Thomas W.,
The Release of Quarantine in Diphtheria 341
Sanitary Aid Societies, Report of Committee on..... 128
Sanitary Associations, List of xlviii
Sanitary Authorities and Associations xxxix
Schools, Hygiene,
Hygiene of the Eyes in the Mexican Schools..... 250
Schroeder, E. C., and de Schweinitz, E. A.,
A Test of the Immunity of Cattle Inoculated With Tuberculosis Over Against a Natural Exposure..... 402
Seaman, L. L.,
Discussion of Papers on Animal Diseases and Animal Food.....262, 264
Discussion of Paper on Venereal Diseases..... 324
Discussion of Report on Canteens in Armies..... 302
Section of Bacteriology and Chemistry, Papers and Reports Presented to.. 329
Sewage,
Methods for the Determination of Free and Albuminoid Ammonia in 354
Studies of Media for the Quantitative Estimation of Bacteria in.... 398

Some Characteristics of the Stegomyia Fasciata Which Affect its Conveyance of Yellow Fever 50
Some Indications That May Serve for the Better Utilization of Vital Statistics 205
Some Statistics of Garbage Disposal for the Larger American Cities in 1902 141
Something About the Bacteriology and Clinical History of Plague..... 255
Starkey, T. A.,
Discussion of Report on Teaching of Hygiene..... 296
State Boards of Health, List of xxxix
Stegomyia Fasciata, Some Characteristics of 50
Sternberg, George M.,
Address of Welcome 13
Discussion of Papers on Animal Diseases and Animal Food..... 261
Discussion of Report on Teaching of Hygiene.....297, 301
Stiles, Ch. Wardell,
Discussion of Papers on Yellow Fever..... 287
Stokes, Wm. Royal,
A Simple Method for the Routine Detection of the Colon Bacillus in Water 359
Study of Media for the Quantitative Estimation of Bacteria in Water and Sewage 398
Swarts, Gardner T., Chairman,
Report of Committee on Disposal of Industrial Wastes..... 166
Report of Committee on Laboratory Tests of the Efficiency of Water Filters 345
Swarts, Gardner T.,
Discussion of Papers on Animal Diseases and Animal Food..... 261

T

The Bacterial Examination of 104 Samples of Water, Together With a Detailed Study of the Colon Bacillus..... 360
The Development of American Bacteriology..... 329
The Effect of Lemon Juice in the Mixture Known as Lemonade Upon Typhoid-Polluted Water 352
The Etiology of Yellow Fever 106
The Floors of Hospital Wards..... 247
The Mosquitoes in Mexico City..... 77
The Passage of Tubercle Bacilli Through the Normal Intestinal Wall..... 404
The Relation Between Human and Bovine Tuberculosis..... 31
The Release of Quarantine in Diphtheria 341
The Sanitary Disposal of Municipal and Institutional Waste by Cremation.. 134
Thirty-first Annual Meeting, Proceedings of 259
Towne, S. R.,
Discussion of Paper on Venereal Diseases..... 326
Discussion of Report on Teaching of Hygiene..... 301
Transportation of Persons Sick With Transmissible Diseases..... 184
Transportation of Dead,
Discussion of Paper on 275
Pertaining to 193
Treasurer's Report 295

Troncoso, M. Uribe,
Hygiene of the Eyes in the Mexican Schools..... 250
Tuberculosis,
A Test of Cattle Inoculated With, Over Against a Natural Exposure 402
The Relation Between Human and Bovine..... 31
Typhoid-polluted water, The Effect of Lemon Juice on..... 352

V

Vaccine Virus, Remarks on the Preparation of..... 221
Valdés, Ulises,
Measures for Restraining the Propagation of Venero-Syphilitic Diseases 244
Venereal Diseases, Discussion of Paper on..... 324
Venero-Syphilitic Diseases, Measures for Restraining the Propagation of 244
Vital Statistics,
Demography and Statistics in their Sanitary Relation..... 201
Discussion of Papers on..... 305
Resolution in re Registration of 321
The Better Utilization of..... 205

W

Waste,
Disposal of Municipal and Institutional, by Cremation..... 134
Report of Committee on Disposal of Industrial..... 166
Water, Studies of Media for the Quantitative Estimation of Bacteria in... 398
Water Supplies,
Discussion of Report on Purification of..... 284
Report of Committee on the Purification of..... 91
The Significance of B. Coli in..... 356
Wilbur, Cressy L.,
Discussion of Papers on Vital Statistics..... 310
Winslow, C.-E. A., and Hansen, P.,
Some Statistics of Garbage Disposal for the Larger American Cities in 1902 141
Woodward, W. C., Chairman,
Report of Local Committee of Arrangements..... 259
Wright, Frank W.,
Treasurer's Report 295
Wyman, Walter,
Discussion of Paper on Plague..... 314
Discussion of Paper on International Agreement in Quarantine..... 277
President's Address 1
Remarks by 328

Y

Yellow Fever,
Comments on the Report of the Committee on..... 47
Concerning the Geographic Distribution of the, Mosquito..... 71
Discussion of Papers on 286
New Aspects of the Etiology of 68
Period of the Disease in Man During Which, Can Be Transmitted to the Mosquito 65

Quarantine Regulations Against, Should Be Based on the Doctrine That it is Only Conveyed by the Mosquito..... 81
Report of, Committee on Etiology of..... 39
Resolution in re 294
Some Characteristics of the Stegomyia Fasciata Which Affect its Conveyance of 50
The Etiology of 406

1Ga1325